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## Introduction and Overview

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In chapter 1 we established that the lexical properties of words, the ultimate constituents of the sentence, determine to a large extent the composition and the structure of the sentence. In this chapter we shall be looking more closely at the structural properties of syntactic representations.

We shall discuss a theory of phrase structure, X-bar theory, which aims at bringing out the common properties of the different types of syntactic constituents such as NP, VP, etc. We shall see that the theory applies both to phrasal constituents and to clausal constituents.

In section 1 we give an overview of the basic notions of phrase structure which we have been assuming so far. In section 2 we develop X-bar theory on the basis of phrasal categories VP, NP, AP, PP. In section 3 we extend the application of X-bar theory to the clausal constituents S and S'. In section 4 we deal with the structural relation c-command and define the notion government in terms of c-command. In section 5 we introduce the binary branching hypothesis and its relevance for acquisition. In section 6 we discuss the idea that syntactic features rather than lexical categories are the syntactic primitives.

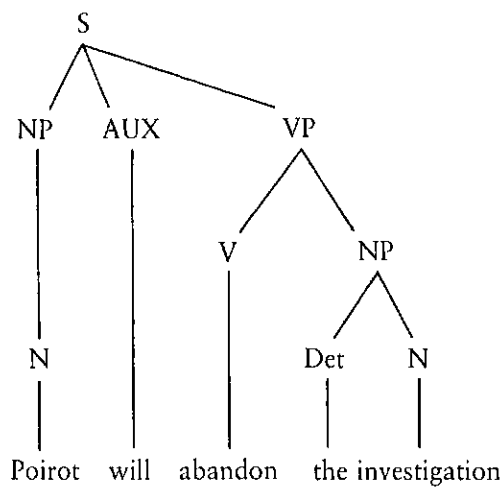
## 1 Syntactic Structure: Recapitulation

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Consider (1a) with its tree diagram representation (1b):

1a Poirot will abandon the investigation.

1b



In (1a) the presence of the NPs *Poirot* and *the investigation* is required by the argument structure of the predicate *abandon*:

2     *abandon*: V

<u>1</u>	2

The presence of the subject NP is also required by the extended projection principle (chapter 1 (79)) which requires that sentences have subjects.

The syntactic categories of phrasal constituents such as VP, NP, etc. are also lexically determined: the VP is a constituent whose head is a V or which is headed by a V, NP is headed by an N, a PP is headed by a P and an AP is headed by an A. The different types of phrases are illustrated in (3), where the head of the phrase is italicized. For each phrasal category we provide a tentative phrase structure rule. The asterisk to the right of a constituent indicates that one or more such constituents are possible, parenthesized constituents are not always present. Obviously, the presence of a constituent may be required because of the argument structure of the head, as discussed in chapter 1.

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- 3a  $VP \longrightarrow V - (NP) - (PP^*)$   
*abandon* the investigation after lunch  
*work* in the garden  
*leave* his house  
*return*
- 3b  $NP \longrightarrow (Det) - (AP^*) - N - (PP^*)$   
*Poirot*  
the *investigation*  
the Belgian *detective*  
the *detective* with the funny accent
- 3c  $AP \longrightarrow (Adv) - A - (PP^*)$   
*interested*  
very *interested*  
*conscious* of the problem  
entirely *aware* of the circumstances
- 3d  $PP \longrightarrow (Adv) - P - NP$   
*in* France  
immediately *after* the investigation  
*on* the Orient Express

When talking about tree diagrams it is useful to have a number of technical terms available to describe the relations between the elements in a tree. We shall briefly recapitulate the basic technical terminology which will be used throughout the book to describe structural relations.

First we can think of the vertical relations between the elements in a tree. We use the term *dominance* to characterize such relations.

#### 4 Dominance

Node A dominates node B iff A is higher up in the tree than B and if you can trace a line from A to B going only downwards.

In (1b) S dominates the NP *Poirot*, AUX, the VP, and indeed all other material inside the sentence. VP dominates the NP *the investigation*, but it does not dominate the NP *Poirot*, since it is not possible to trace a line from VP to the NP *Poirot* going only downwards.

It is sometimes useful to distinguish a more specific type of dominance. Consider the relationship between S and AUX, for example. S dominates AUX, and moreover, there is no intervening node between S and AUX: this is called **immediate dominance**. S also dominates the NP *the investigation* but it does not immediately dominate this NP.

We can also look at the tree diagram from a horizontal perspective and describe the left-right ordering of constituents in terms of precedence.

### 5 Precedence

Node A precedes node B iff A is to the left of B and A does not dominate B or B does not dominate A.

In (1b) AUX, for instance, precedes VP. VP does not precede AUX, since VP is to the right of AUX. Also, even though S is to the left of VP in our tree diagram, S does not precede VP because it dominates it.

Again we can distinguish precedence from immediate precedence: if a node A precedes a node B and there is no intervening node, then A immediately precedes B. AUX immediately precedes VP, the NP *Poirot* precedes the VP, but does not immediately precede it.<sup>1</sup>

In (1b) the NP node dominating *Poirot* is non-branching: there is only one line which starts at NP and goes downwards (in our example to N). The node S is branching, three lines originate from S and go downwards to NP, AUX and VP respectively. We return to a discussion of branching nodes in section 5.

Among the NP positions in a syntactic representation we distinguish those like the subject position or the object position which are occupied by arguments from those which are occupied by adjuncts. The former are called A-positions; the latter A'-positions (i.e. A-bar positions). We shall often need to refer to this distinction in later chapters.

Let us now focus on the structure of VP. VP immediately dominates V and NP. If we compare the tree diagram representation of syntactic structure with genealogical trees, then it is as if both V and NP are children of the same parent. Linguists refer to this relationship as one of sisterhood: V and the object NP are sisters. Similarly, we can say that VP is the mother of the NP *the investigation*.

The verb *abandon* has a close connection with its object, witness the fact that the object cannot be omitted. In languages with rich case systems the choice of verb may sometimes determine the morphological case of the following NP. In German, for instance, *helfen* ('help') takes a DATIVE complement while *sehen* ('see') takes an ACCUSATIVE.<sup>2</sup>

<sup>1</sup> It has been proposed that all relations in tree diagrams must be able to be described in terms of dominance and precedence relations. For some formal discussion, see Lasnik and Kupin (1977). Alternative proposals are found in Goodall (1987), Haegeman and van Riemsdijk (1986) and Zubizarreta (1985). These works are very advanced.

<sup>2</sup> We discuss the notion of case in chapter 3.

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<sup>5</sup> The  
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- 6a Ich helfe dem Mann.  
I help the-DATIVE man  
6b Ich sehe den Mann.  
I see the-ACCUSATIVE man

Using terminology from traditional grammar we shall say that the verb **governs** the object, and more generally that the head of a phrase governs the complement. The element which governs is called the **governor**; the element that is governed is called the **governee**.

At this point we shall not try to give a very precise definition. Let us propose that government by a head is based on sisterhood.<sup>3</sup>

## 7 Government (1)

- A governs B if  
(i) A is a governor;  
(ii) A and B are sisters.  
Governors are heads.

In (1b) *abandon*, the governor, is the head of the VP and the direct object, the governee, is its sister. V does not govern the subject NP *Poirot*: V is not a sister of the NP. If X is a head and it governs Y then X **head-governs** Y.<sup>4</sup> All the constituents governed by a node constitute the **governing domain** of that node. In our example VP is the governing domain of V.

In our discussion of external and internal arguments in chapter 1 (section 7.2), the question might have been raised why arguments of a verb should be realized inside the VP. One possible answer is that the verb can only assign an internal theta role to NPs or clauses that it governs. Hence an NP attached somewhere outside the governing domain of the verb would not be able to receive an internal theta role from the V.<sup>5</sup> When a V governs an element and assigns an internal theta role to it we say that it **theta-governs** this element. In (1b) the V *abandon* **theta-governs** the object *the investigation* though not the subject *Poirot*.

<sup>3</sup> Throughout the book we shall offer more and more refined definitions of government. In addition to government by a head, as discussed here, we shall also introduce government by a phrase in chapter 8.

<sup>4</sup> We return to the notion government in section 4 below.

<sup>5</sup> The assignment of theta roles will turn out to be more complex than is suggested in this section. The reader is referred to chapter 6.

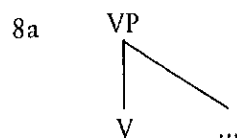
## 2 The Structure of Phrases

In this section we examine the structure of the phrases, VP, NP, AP and PP. Our aim is to discover the common properties of these four phrase types. On the basis of our analysis we shall be able to replace the four phrase structure rules in (3) by one simplified and general rule. We shall start the discussion with the VP and then extend it to NP, AP and PP.

### 2.1 The Verb Phrase

#### 2.1.1 LAYERED VPs

So far we have discussed phrases in terms of two components: the head, a lexical category, and the projection, a phrasal category. Phrasal categories are headed by lexical categories. Schematically, VPs, for example, are constituents with the following structure:



where...stands for non-head material in the VP, obligatory or optional. An alternative way of representing the structure of a phrase is by using the format of rewrite rules or phrase structure rules.

8b       $VP \longrightarrow V - \dots$

Consider (9):

9      Miss Marple will [<sub>VP</sub> read the letters in the garden shed this afternoon].

Along the lines of the representation in (3a) sentence (9) will be represented as in (10):

10

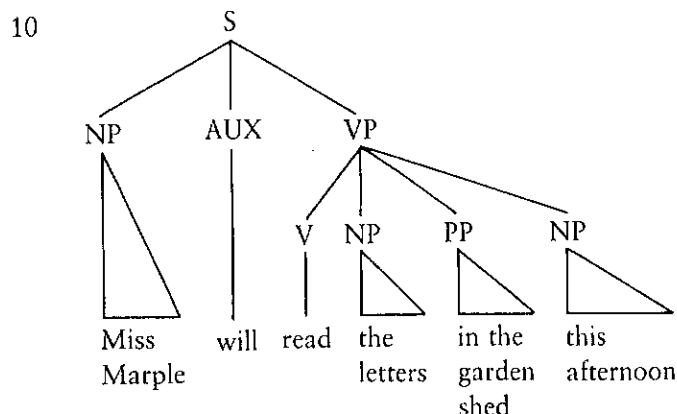
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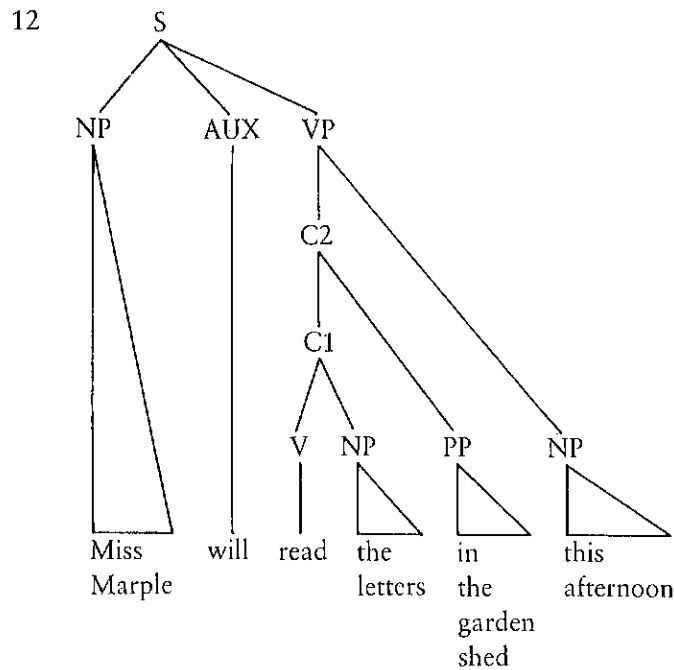
The structure of the VP in (10) is *flat*: there is no internal hierarchy between the constituents of V: all VP-internal constituents are treated as being on an equal footing. Such a flat structure might not be the best representation of the VP, however. Consider, for instance, the following examples, which are all intuitively felt to be related to (9):

- 11a Miss Marple will read the letters in the garden shed this afternoon and Hercule Poirot will do so too.  
 11b Miss Marple will read the letters in the garden shed this afternoon and Hercule Poirot will do so tonight.  
 11c Miss Marple will read the letters in the garden shed this afternoon and Hercule Poirot will do so in the garage tonight.

In (11), *do so* in the second conjunct substitutes for some part of the first conjunct. In (11a) *do so* substitutes for the entire VP *read the letters in the garden shed this afternoon*. In chapter 1 we have adopted the idea that substitution is structure-determined: only constituents can be substituted for by an element. From this point of view, the representation in (10) is unproblematic: *do so* replaces the entire VP, a constituent.

In (11b) *do so* substitutes for only part of the VP: *read the letters in the garden shed*, and in (11c) it picks up an even smaller part of the VP: *read the letters*. If we maintain the hypothesis that substitution is structure-determined, then it will be hard to reconcile the data in (11b) and (11c) with the representation in (10). On the basis of (10) substitutions affecting VP could be expected to affect either the top-node VP, i.e. the entire VP (as in (11a)), or

each of the VP-internal constituents, that is to say V or NP or PP. But the structure does not allow for treating the strings *read the letters in the garden shed* or *read the letters* as constituents. There is no node which exhaustively dominates *read the letters*, for example. In order to maintain our hypothesis that substitution affects constituents only we need to redesign the tree diagram in (10) and elaborate the structure of its VP:



The VP in (12) has more internal structure than that in (10): it is hierarchically organized. The string *read the letters* is represented as a constituent, provisionally labelled C1 and can serve as a unit to be substituted for by *do so*. The same holds for *read the letters in the garden shed*, labelled C2. Unlike (10), (12) is compatible with the substitution data in (11).

We may wonder about the category of C1 and C2 in (12). Following our informal analysis above, we are tempted to say that, being headed by a V (*read*), they are projections of V, i.e. a type of VP. But on the other hand, they do not constitute the full VP or the maximal VP of the sentence. The projections of V, C1 and C2 are themselves dominated by verbal projections. C2 is dominated by VP and C1 is dominated by C2 and by VP. Projections of V that are dominated by more comprehensive projections of V are called *intermediate projections* of V. The highest projection of V, the node labelled

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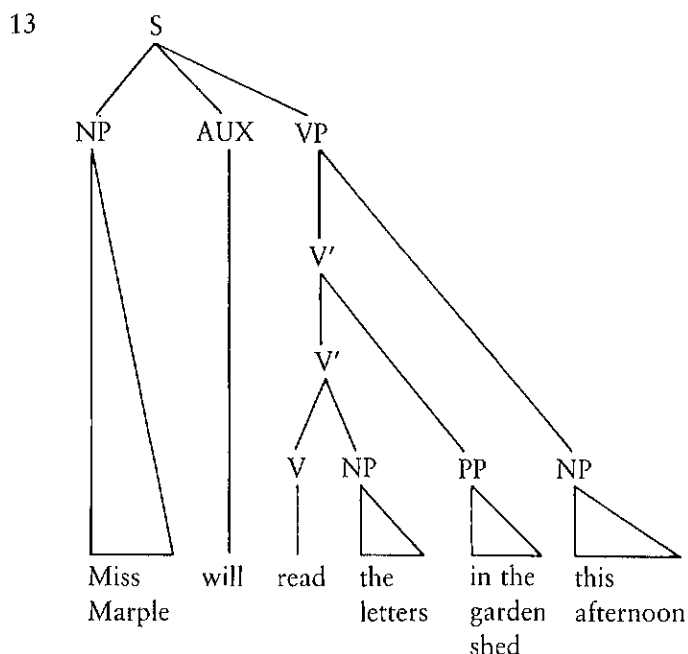
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VP in our diagram, is the maximal projection. The maximal projection is not normally dominated by a projection of the same category.<sup>6</sup> The intermediate projections of V, are labelled V-bar, or V'.



In (13) VP has a layered structure. There are different levels of projection. The direct object NP, *the letters*, is a complement of the verb, it is theta-governed by the verb. This NP combines with the head to form the lowest V', the first projection in (13). In the case of *do so* substitution we see that the minimal unit affected by substitution is the first projection of the type V'. *Do so* cannot simply replace V without the direct object:

- 14 \*Miss Marple will read the letters in the garden shed this afternoon and Hercule Poirot will do so the diaries in the garage after dinner.

In (13) the verb projections that dominate the lowest V' are also labelled V'. The PP *in the garden shed* and the NP *this afternoon* are adjuncts; they combine with a V' to form another V'. Adjuncts are optional constituents and

<sup>6</sup> We return to the notion of maximal projection in chapters 7, 9 and 10.

they can be repeated: the level  $V'$  is recursive. The node labelled VP in (13) is in fact another  $V'$ : it dominates  $V'$  and an adjunct. (13) suggests that the maximal projection of V is thus the highest  $V'$  which is not dominated by another V-projection. This, however, turns out to be inadequate. Consider (15):

- 15a The detectives have all read the letters in the garden shed after lunch.  
 15b All the detectives have read the letters in the garden shed after lunch.  
 15c They have?  
 15d \*They have all?  
 15e The policemen have all done so too.

In (15a) the VP is similar to that of our earlier examples, but it is preceded by the quantifier *all*. *All* relates to the subject NP *the detectives*: (15a) is closely related to (15b). (15c) is an example where the VP of the sentence is deleted. Interestingly, VP-deletion affects *all*, and *all* cannot be stranded, witness the ungrammaticality of (15d). We conclude that *all* is part of the VP. On the other hand, in (15e) *do so* substitutes for the string *read the letters in the garden shed this afternoon*, a  $V'$ . This means that *all* must be structurally independent from this  $V'$ . *All*, the quantifier, is not an adjunct of time or place like the post-verbal PPs. It is not recursive, there can only be one quantifier to the left of V. In order to distinguish VP-adjuncts, which combine with  $V'$  to form  $V'$ , from the quantifier which combines with the highest  $V'$  to form the full VP, we identify the position occupied by the quantifier *all* as the specifier position. The specifier dominated by VP is often represented as [Spec,VP]. [Spec,VP] combines with  $V'$  to form a  $V''$  projection.<sup>7</sup>  $V''$  is the highest V-projection, which we equate with VP. For typographical reasons we shall usually replace  $V''$  by VP.

<sup>7</sup> The analysis of *all* as occupying the VP specifier position is based on work by Sportiche (1988a). Sportiche's account introduces further modifications of phrase structure which we shall discuss in chapter 6 (section 5).

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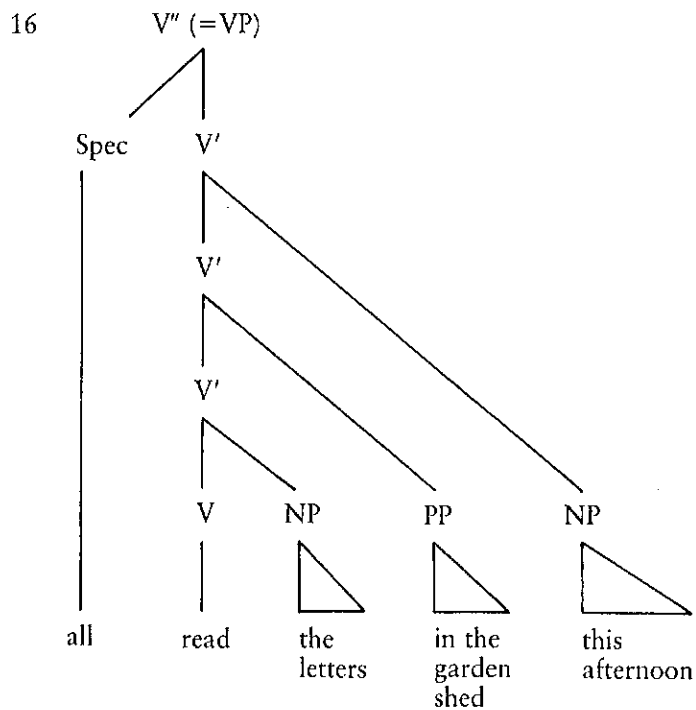
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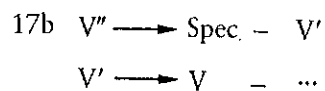
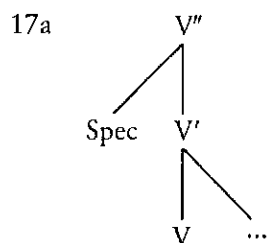
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Schematically, English VPs are formed according to the following format:

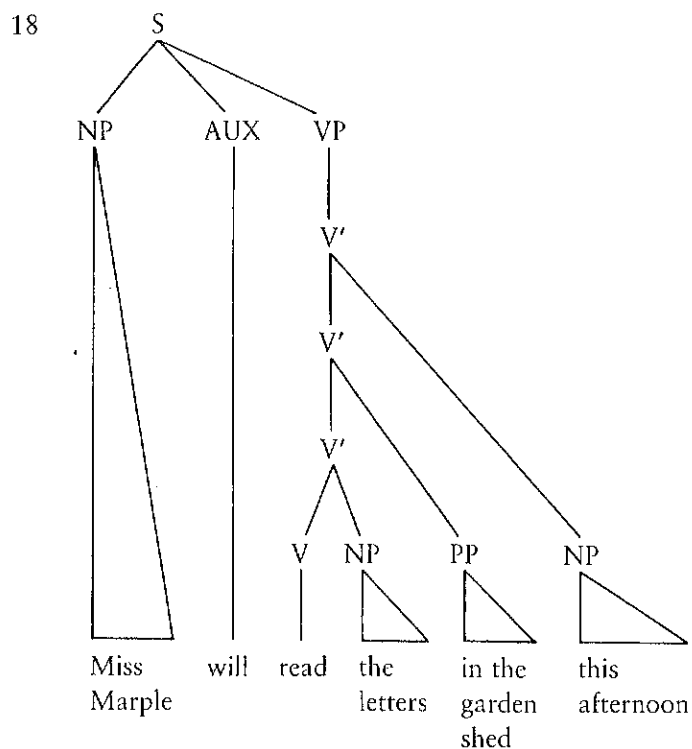


A complement combines with a V to form a V'. Adjuncts combine with V's to form higher V's. A V-projection may hence contain several V' nodes.

The specifier combines with  $V'$  to form  $V''$ .  $V''$  is the maximal projection of  $V$  and corresponds to VP in our earlier tree diagrams.

Let us consider some further examples of VP structures. We must point out that often there may be no overt specifier in the VP of a given sentence, as seen in our earlier examples, or the VP may contain no adjuncts or no complements. We shall assume that the three levels,  $V$ ,  $V'$  and  $V''$  are available for *any* VP in English, even if there is no overt material to attach to the different levels; the structure in (17) applies to every VP.<sup>8</sup>

Let us first return to example (9), which lacks the pre-verbal specifier. The representation (13) will be revised as in (18): there is no pre-verbal specifier; VP (or  $V''$ ) is non-branching.<sup>9</sup>



In (19a), there is again no specifier and also there is no direct object NP, *sleep* being intransitive. The lowest  $V'$  is non-branching. *After lunch* is an

<sup>8</sup> For some discussion of this problem the reader is referred to Chomsky's discussion (1986b: 2-4).

<sup>9</sup> Another option would be to say that [Spec, VP] dominates a node which is not lexically filled. I shall not discuss this alternative here.

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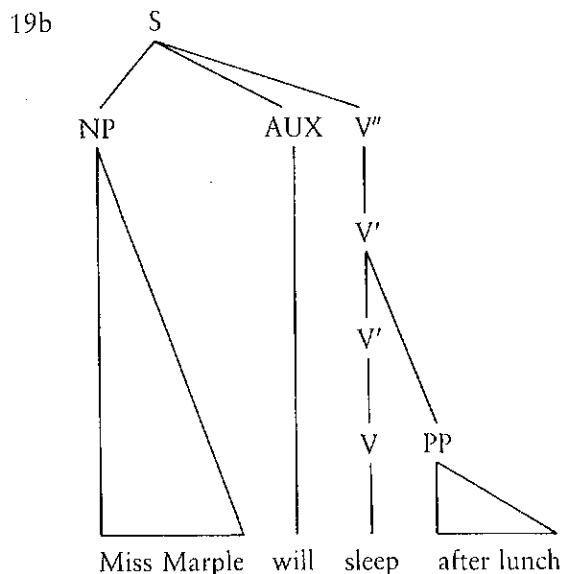
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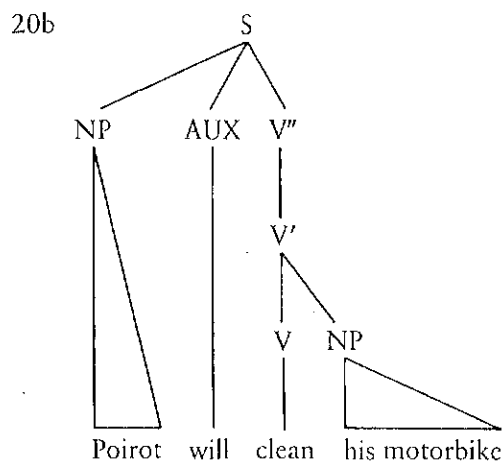
adjunct, which combines with the lowest  $V'$  to form another  $V'$ .  $V''$  is also non-branching. The representation of (19a) will be as in (19b):

19a Miss Marple will sleep after lunch.



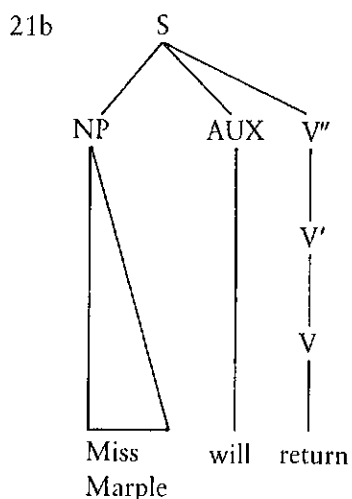
(20a) lacks a specifier and VP-adjuncts, we represent its structure in (20b):

20a Poirot will clean his motorbike.



Finally, it is also possible that a VP simply dominates a verb and that there are no specifiers, adjuncts or complements. This is illustrated in (21a) with the representation in (21b):

21a Miss Marple will return.



### 2.1.2 THE ORDER OF CONSTITUENTS

The projection schema for VPs developed so far is based solely on English examples; it is too rigid to apply universally. We have already seen that the word-order in Japanese differs considerably from that in English, for instance. Consider the following examples:

- 22a John ga Mary o but- ta.  
       nominative accusative past  
       particle particle tense  
       John Mary hit  
       'John hit Mary.'
- 22b John ga Mary ni hon o yat-ta.  
       nom dative acc. past tense  
       John Mary book give  
       'John gave Mary a book.'
- 22c John ga Mary to kuruma de Kobe ni it-ta.  
       John Mary with car by Kobe to go-past  
       'John went to Kobe by car with Mary.'
- (from Kuno, 1973: 3, 5).

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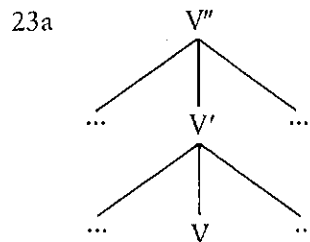
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Japanese is an SOV language: the verb follows objects and adjuncts (Kuno, 1973: 3). Clearly, if we wish to devise a universal schema for V-projections then the order of the constituents in (17) is too rigidly fixed: (17) only allows for VO. It would be desirable to have a schema which allows both the order OV and the order VO and which relies on some other principle to account for language-specific orderings. We shall adopt this hypothesis here and propose the following projection schema for V:



- 23b
- V'' → Spec; V'
  - V'\* → V' ; XP
  - V' → V; XP

In (23a) the ellipses dominated by V'' stand for the potential specifier, those dominated by V' for adjuncts or for complements. In (23b) Spec stands for the specifier, XP stands for adjuncts or complements. The semi-colon between the constituents in (23b) serves to indicate that they are not linearly ordered. The order of V and its complement XP, for instance, will be fixed according to language-specific options. V'\* in (23b) allows for recursion of V', indicated by the asterisk \*.<sup>10</sup>

### 2.1.3 EXTENDING THE PROPOSAL

One question that immediately comes to mind is whether the hierarchical structure of VP proposed in section 2.1 can be extended to the other phrasal categories. If this were possible, we might be able to replace the four phrase structure rules in (3) by a single schema. Clearly, for reasons of economy, a theory which has one generalized schema for phrasal categories of various types is to be preferred to one in which distinct phrases are constructed on the basis of different schemata. If we are able to develop one general format, this

<sup>10</sup> For further discussion of adjuncts and phrase structure rules the reader is referred to chapter 7.

will mean that we have brought out the common properties between the phrases, a generalization which is lost if we adopt four unrelated phrase structure rules.

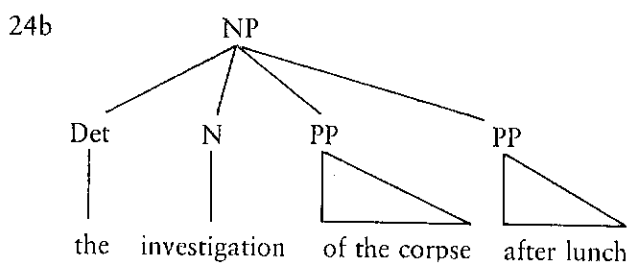
In the following sections we turn to the other lexical categories. In section 2.2 we discuss noun phrases, in section 2.3 adjective phrases and in section 2.4 prepositional phrases. We shall see that the projection schema developed for VP can be applied to all the categories examined.

## 2.2 Noun Phrases

Consider (24a):

24a the investigation of the corpse after lunch

Tentatively we might draw a flat structure for (24a) along the lines suggested by phrase structure rule (3b):



But (24b) is observationally inadequate since it fails to throw light on the *one*-substitution data in (25).

25 The investigation of the corpse after lunch was less horrible than the one after dinner.

In (25) *one* substitutes for the string *investigation of the corpse* but this string is not a constituent in the representation (24b): it is not exhaustively dominated by one node. A closer look at the data argues for a layered structure of NP by analogy with that of VP. On the one hand, *one* in (25) substitutes for the string *investigation of the corpse*, strongly suggesting that this string should be

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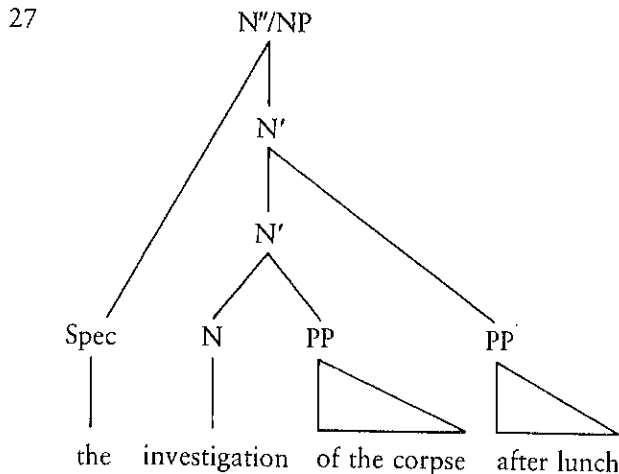


exhaustively dominated by one node in the syntactic representation. On the other hand, we can compare the NP (24a) with the VP of (26):

26 The police will [<sub>VP</sub> investigate the corpse after lunch].

It is intuitively attractive to argue that the relationship between the N *investigation* and the PP *of the corpse* in (24a) is like that between the verb *investigate* and its object NP *the corpse* in (26). Both the V *investigate* and the N *investigation* have a thematic relation with the NP *the corpse*. We return to the role of *of* in chapter 3.

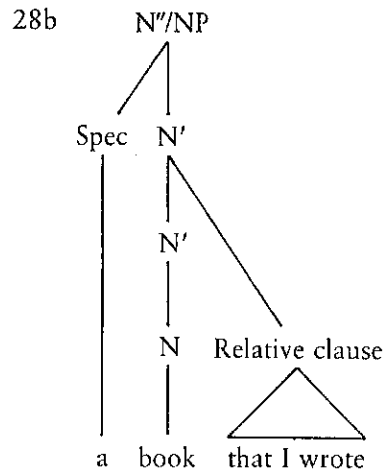
If the relation between the V *investigate* and its complement NP *the corpse* is intuitively felt to be like that between the N *investigation* and the NP *the corpse*, then we would miss a generalization if we were to treat the NP structure as unrelated to the VP structure. One way of integrating NPs in the format established so far is to propose the following structure for the NP (24a):<sup>11</sup>



<sup>11</sup> We shall usually replace N'' by NP for typographical reasons. In recent work it has been proposed that the head of NP is not N but rather the determiner. NP is reinterpreted as DP. This analysis has come to be known as the DP-hypothesis. The reader is referred to Abney (1987) for motivation. However, Abney's work should only be tackled after this book has been worked through.

The lowest  $N'$  projection dominates  $N$ , the head of the phrase and its complement.<sup>12</sup> An adjunct combines with  $N'$  to form another  $N'$ . Adjuncts are typically PPs as in (24a) or relative clauses, as in (28) below.<sup>13</sup> The specifier of NP, a determiner, combines with the topmost  $N'$  to form the maximal projection,  $N''$  or NP.

28a a book [that I wrote]

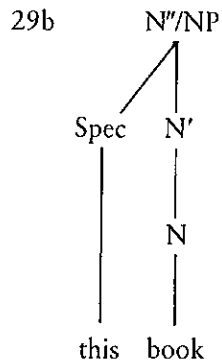


Like VPs, NPs may lack overt specifiers, complements or adjuncts, but we still generate the three levels of projection. In (29a), for instance, there is neither a complement nor an adjunct. In the syntactic representation (29b)  $N'$  is non-branching.

29a this book

<sup>12</sup> As mentioned before, the reason why complements of  $N$  must be realized as PP will be discussed in chapter 3.

<sup>13</sup> We shall address the internal structure of relative clauses in chapters 7 and 8.



In English, the head noun precedes its complement and adjuncts, but again this is not a universal property.<sup>14</sup> To give but one example: in Japanese, relative clauses precede the head N:

30a *English*:

a book [that I wrote]

30b *Japanese*:

[watakusi ga kaita] hon

I wrote book

(Kuno, 1973: 234).

Demonstrative pronouns, i.e. specifiers, also precede the head N in Japanese:

<sup>14</sup> Indeed in English too the complement NP may appear before the head noun:

- (i) The painting of Saskia.
- (ii) Saskia's painting.

We can compare the relation between (i) and (ii) to that between an active sentence (iii) and its passive parallel (iv):

- (iii) Rembrandt painted Saskia.
- (iv) Saskia was painted by Rembrandt.

We discuss passivization in chapter 6.

- 31 kono hon  
this book  
(Kuno, 1973: 235)

In order to allow for cross-linguistic variation in word-order we shall have to assume a very general phrase structure schema along the lines of (23b) for VP, which does not impose a strict ordering on the constituents of the phrase:

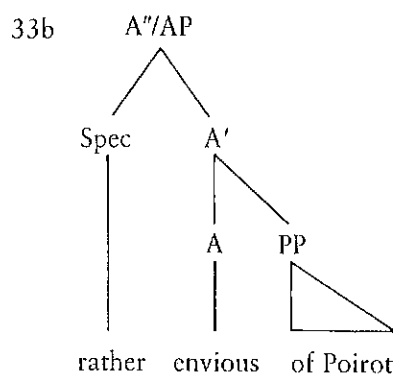
- 32  $N'' \rightarrow \text{Spec}; N'$   
 $N'^* \rightarrow N'; XP$   
 $N' \rightarrow N; XP$

For each of the PS-rules the order is fixed according to the language in question.

### 2.3 Adjective Phrases

Looking at APs it seems entirely reasonable to extend the layered analysis of VP and NP above and to distinguish different levels of projection:

- 33a Jeeves is [<sub>AP</sub> rather envious of Poirot].



Like the verb *envy*, the adjective *envious* is a two-place predicate. In (33a) the subject NP *Jeeves* realizes one argument, the PP *of Poirot* contains the

second argu  
projection  
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may follow

- 34a Er is  
he is  
'He'  
34b Er is  
he is  
'He'

In (34), t  
assume t  
language-

### 2.4 P

PPs too  
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35b riq

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<sup>15</sup> For :  
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second argument. We discuss the role of the preposition *of* in chapter 3. The projection A' dominates the lexical head *envious* and its complement.

As was the case for VP, the order of the AP constituents varies cross-linguistically: adjectives may precede their complements as in English, or they may follow them, as in German:

- 34a Er ist des Französischen mächtig.  
       he is the French (GENITIVE) able  
       'He has a command of French.'
- 34b Er ist seinen Grundsätzen treu.  
       he is his principles (DATIVE) faithful  
       'He is faithful to his principles.'

In (34), the adjectives *mächtig* and *treu* follow their NP complements. We assume that the relative order of the adjective and its complement is a language-specific property.<sup>15</sup>

## 2.4 Prepositional Phrases

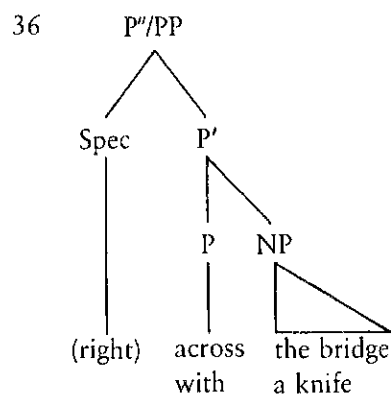
PPs too can be assimilated to the schema proposed so far. Prepositions usually require an NP complement.

- 35a across [<sub>NP</sub> the bridge]  
       with [<sub>NP</sub> a knife]  
 35b right across [<sub>NP</sub> the bridge]

Using the pattern adopted for VP, NP and AP as a model, we can propose the following structure:

<sup>15</sup> For a discussion of the GENITIVE the reader is referred to chapter 3, specifically section 3.2.1.2.

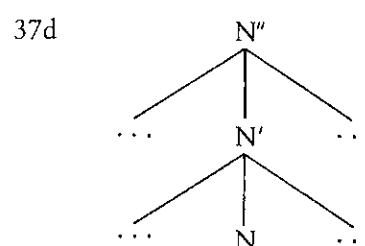
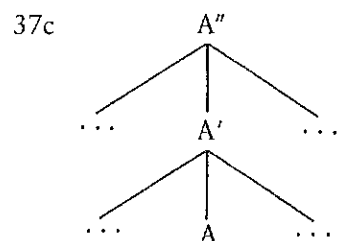
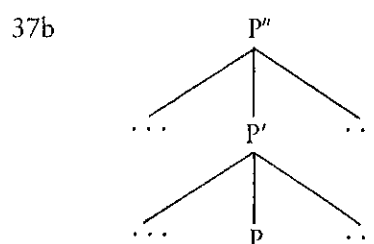
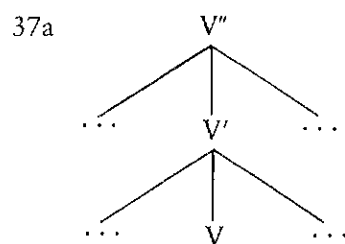
Often authors try to derive the word-order variation between different languages from other principles of the grammar. One possibility, for instance, is to argue that heads assign their thematic role in one direction only. If V in English assigns the theta role to the right then we expect that the object NP must follow V.



Again the ordering of  $P$  and the complement is not universally fixed. In Japanese, elements corresponding to English prepositions follow their complements and are referred to as postpositions (see (22c)). Let us use the label  $P$  to indicate both pre- and postpositions.

## 2.5 X-bar Theory

From the discussion above it appears that for all lexical categories ( $N, V, P, A$ ) the format of phrasal projection can be represented by means of the layered representation. (37) summarizes the discussion:



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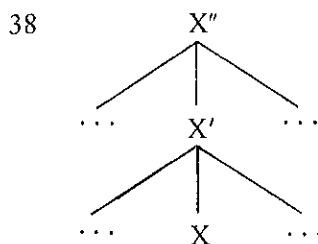
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This means that we no longer need four different phrase structure rules, as suggested in (3). Abstracting away from the category of the head we arrive at the following schema:



where X stands for N, V, A or P. Our grammar need not contain four schemata, but only one. The general format for phrase structure is summarized in the following PS-rules:

- 39a  $X'' \longrightarrow \text{Spec}; X'$
- 39b  $X'^* \longrightarrow X'; YP$
- 39c  $X' \longrightarrow X; YP$

The part of the grammar regulating the structure of phrases has come to be known as X-bar theory.<sup>16</sup> X-bar theory brings out what is common in the structure of phrases. According to X-bar theory all phrases are headed by a lexical head. In the terminology of traditional linguistics we say that all phrases are *endocentric*. The lexical head of the projection is a *zero projection* ( $X^0$ ). X-bar theory distinguishes two levels of projection. Complements combine with X to form  $X'$  projections (39c); adjuncts combine with  $X'$  to form  $X'$  projections (39b). The specifier combines with the topmost  $X'$  to form the maximal projection  $X''$  (39a). For convenience' sake we usually replace  $X''$  by  $XP$ .<sup>17</sup>

While it is assumed that the layered projection schema in (39) is universal, we have already seen that the order of constituents with respect to the head of the projection is not universally fixed. We assume that some other principle of

<sup>16</sup> The theory has developed as a result of proposals by Chomsky (1970).

<sup>17</sup> For an early discussion of the theory and its application to English, see Jackendoff (1977). However, note that many of Jackendoff's proposals have been subject to major revisions. For a survey of the origins and development of X-bar theory, the reader is referred to Stuurman (1985). Muysken (1983) offers a reinterpretation of the theory in terms of features (see section 6).

the grammar accounts for the various constituent orders.<sup>18</sup> The specific phrase structure rules for one language, say English, can be derived from the general schema in (39) and the, as yet to be specified, principle which fixes the relative order of head, complements, adjuncts and specifiers. Language-specific phrase structure rules need not be stated separately since they follow from other, more general, principles.

We have also seen that there are differences between the internal structures of the phrases. For instance, V and P take NP complements, while N and A do not take NP complements. Such differences will be explained by independent mechanisms of the grammar. In chapter 3, for instance, we shall see that case theory explains that nouns and adjectives cannot take NP complements.

As the reader will observe, the result of our discussion is that the construction-specific phrase structure rules in (3) are broken down into several separate general rules and principles which capture what is common between the different phrases.

If we can treat phrase structure universally in terms of this general projection schema (39), then we may further assume that the child learning a language need not construct this schema as part of its grammar. The principles of X-bar theory will be part of UG, they are innate.<sup>19</sup>

On the other hand, UG does not fix the order of constituents. The ordering constraints found in natural languages vary cross-linguistically and they thus have to be learnt by the child through exposure. Very little data will suffice to allow the child to fix the ordering constraints of the language he is learning. A child learning English will only need to be exposed to a couple of transitive sentences to realize that in English verbs precede their complements.

<sup>18</sup> It is often proposed that there is a correlation between the ordering of the head and its complement and adjuncts in VP, PP, AP, etc. For instance, it is often proposed that languages which have OV order also have postpositions and adjectives that follow their complements. This is by no means a universal property. See Greenberg (1963, 1978) for some discussion.

<sup>19</sup> There is a lot of discussion as to whether (39) is indeed universal. It is sometimes argued that certain languages are not subject to the hierarchical organization in (39). Languages which are not subject to the hierarchical organization are called **non-configurational** languages. If we adopt the view that certain languages are not hierarchically organized but are basically 'flat', then we must give up the idea that (39) is universal and we must introduce some parameter to distinguish configurational languages subject to (39) from non-configurational languages.

One example of a language which has been claimed to be non-configurational is Hungarian (see Kiss, 1981) and another is Warlpiri (see Hale, 1983). Maracz and Muysken (1989) contains a series of recent papers on the configurationality issue in various languages.

3 7

3.1

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41b

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### 3 The Structure of Sentences

#### 3.1 Introduction: the Problem

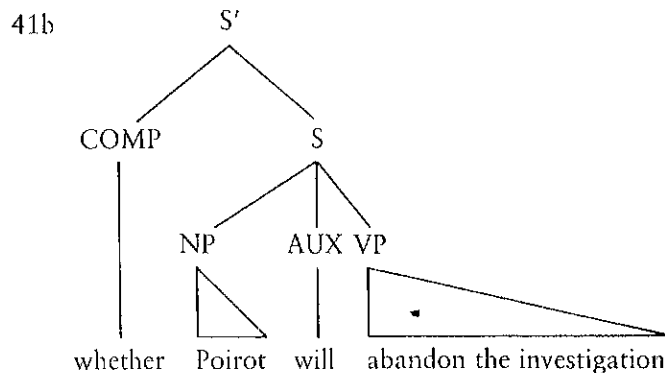
So far we have achieved quite an interesting general approach to phrase structure: for all the phrasal categories we have developed the hypothesis that they are structured according to the X-bar schema (39). Nothing has been said about the larger unit of syntactic analysis, the sentence.

We start our discussion on the basis of the bracketed clause in (40):

40 They will wonder [whether Poirot will abandon the investigation].

In (40) the bracketed string is a constituent composed of sentence (1) of this chapter preceded by the complementizer *whether*. Assuming that the string *Poirot will abandon the investigation* is a syntactic unit, a sentence, the bracketing in (40) can be refined to set this sentence off from the complementizer. In standard generative syntax the simple sentence *Poirot will abandon the investigation* is labelled S and this S together with the complementizer is labelled S'.<sup>20</sup> Omitting details of the internal structure of VP (hence the triangle), (41a) has the representation in (41b):

41a They will wonder [<sub>S</sub> whether [<sub>S</sub> Poirot will abandon the investigation]].



<sup>20</sup> The PS rule  $S' \rightarrow \text{COMP} - S$  is due to Bresnan (1970).

As it stands this representation is not an instantiation of the X' schema (39). If S', as the name suggests, is a projection of S, then this is an odd projection. In the X'-schema, phrasal projections project from their heads, words of the type N, V, etc. In (41) the labelling suggests that S' is a projection of a higher level unit, S. S does not look like a projection of a head either. S has three immediate constituents: two are phrasal themselves (NP and VP) and one is an auxiliary.

One possibility would be to say that S' and S are not endocentric categories but exocentric ones: they are not projections of heads but are somehow composed of several units next to each other. This would mean that our grammar will have to include the projection schema (39) and in addition one or more schemata to account for the structure of S and S'. Such a grammar will suggest that there is little or nothing in common between the structure of the phrasal constituents such as NP, VP, etc. and that of clausal constituents. This proposal will also entail that the child learning the language will have to differentiate the two types of structures and apply each to the relevant categories.

It would, of course, be more attractive if the structure of clauses could be assimilated to the schema in (39), thus generalizing the X-bar schema to all types of constructions. If this were possible, one X-bar format would apply both to phrases and to clauses and the child would operate with one schema rather than several.

A closer look at the structure of clauses will allow us to extend the schema in (39) to sentence structure. In section 3.2 we discuss the structure of S. We shall see that it is reasonable to argue that S is headed by the constituent indicated by AUX and relabelled I for INFL and that it is organized along the lines in (39). In section 3.3 we turn to S' for which we shall argue that it is headed by the complementizer, C, and again follows the schema in (39).

### 3.2 S as a Projection of INFL

#### 3.2.1 AUX AND TENSE

In (41b) S has three immediate constituents: the subject NP (*Poirot*), the VP (*abandon the investigation*) and the auxiliary (*will*). Looking at the X' format in (39) we can ask ourselves first which of these three could in principle qualify as a head. One possibility presents itself: *will* is a word, a lexical unit. This observation might tempt us to adopt the hypothesis that *will*, i.e. AUX, is the head of S.<sup>21</sup> The analysis will extend automatically to sentences containing

<sup>21</sup> In Jackendoff (1977) it was proposed that S was headed by V. This proposal was abandoned later (cf. Hornstein, 1977). See also Abney (1987) for discussion.

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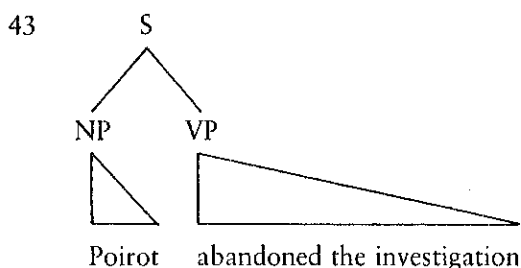
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other modal auxiliaries such as *can*, *may*, *must*, *shall* and can also be applied to sentences containing the aspectual auxiliaries *have* and *be*.

One problem for this proposal arises immediately: if AUX is the head of S, then what do we do with sentences without overt auxiliary such as (42)?

42 Poirot abandoned the investigation.

At first glance one might adopt the following syntactic representation:



In (43) it would not be at all clear which lexical category is to head S. It turns out that there are empirical arguments against the representation (43). Consider the examples in (44):

44a Abandon the investigation, Poirot did indeed.

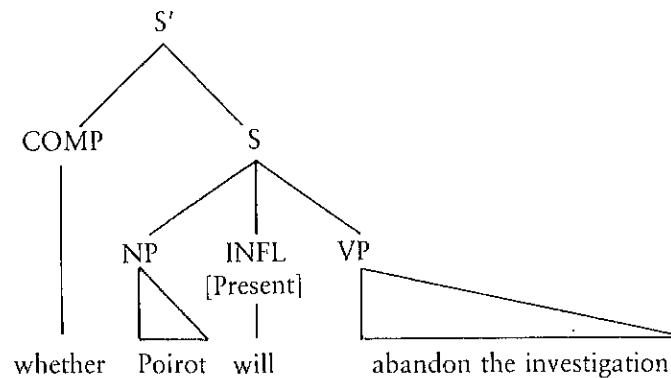
44b What Poirot did was abandon the investigation.

In (44a) the verb *abandon* and its direct object NP *the investigation* have been preposed and the past tense affix is left behind on an auxiliary (*did*). If we assume that only constituents can move, we must conclude that *abandon the investigation* is a constituent which is relatively independent from the past tense. Such an interpretation of the structure of the sentence is difficult to reconcile with (43) where tense is an integral part of the VP. The pseudo-cleft construction in (44b) illustrates the same phenomenon: *abandon the investigation* is separated off from its past tense.

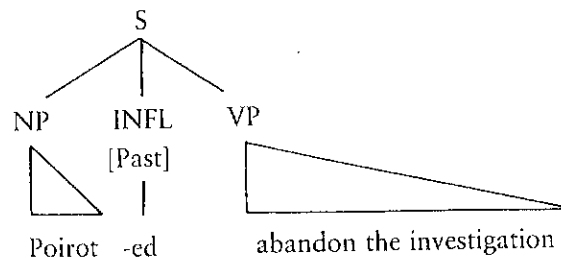
These data suggest strongly that at a more abstract level of representation the inflectional element tense cannot be part of the VP, but must be generated separately from it. In (41) the tense specification of the sentence is separate from VP and it is associated with the AUX node (*will* is the present tense of the auxiliary, *would* is the past tense). AUX in (41b) is the site on which tense is realized.

Let us capitalize on this observation and posit that in all sentences, with or without overt auxiliaries, tense is located under a separate node which we shall from now on label **INFL**, for **inflection**. We return to the label in the section below. In sentences with an auxiliary which is inflected for tense (such as (41)) the tensed auxiliary is generated under INFL. INFL replaces AUX. In sentences without overt auxiliary we propose that tense is an independent category dominated by INFL. Under this analysis, the relevant part of (41a) will have the structure (45a) and (42) will have the structure (45b):

45a



45b



In (45b) INFL is specified for past tense and dominates the *-ed* affix. VP is a constituent separate from the past tense. Hence we expect that VP may move independently of the tense ending. Being an affix, the past tense ending cannot be left unattached, it must be attached to the verb. We shall assume that in (45b) the past tense morphology is lowered onto the verb.<sup>22</sup>

<sup>22</sup> In sentences with the auxiliary *do* this auxiliary will appear under INFL and pick up the tense ending.

3.2.2

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### 3.2.2 AGREEMENT

We have proposed that there is a separate node INFL which dominates tense in English. However, as the label suggests, INFL is a node which is taken to dominate all verbal inflection, i.e. including person and number properties.

In English the inflectional properties of verb conjugation are minimal, but other languages have richer paradigms of conjugation. Person and number agreement, which is present in other languages, often does not have any morphological realization in English. Compare the following data from English, French and Italian. For each language we give the conjugation for present and past tense and at the bottom of each column we indicate the total number of distinct forms:

#### 46a English

<i>Present tense</i>	<i>Past tense</i>
I speak	I spoke
you speak	you spoke
he speaks	he spoke
we speak	we spoke
you speak	you spoke
they speak	they spoke
<i>2 forms</i>	<i>1 form</i>

#### 46b French

je parle	je parlais
tu parles	tu parlais
il parle	il parlait
nous parlons	nous parlions
vous parlez	vous parliez
ils parlent	ils parlaient
<i>5 forms</i>	<i>5 forms<sup>23</sup></i>

<sup>23</sup> In French there are five forms if we take orthography into account. However, for many verbs (such as *parler* in (46b)), first person singular, second person singular and third person verb forms sound the same.

46c *Italian*

io parlo	io parlavo
tu parli	tu parlavi
egli parla	egli parlava
noi parliamo	noi parlavamo
voi parlate	voi parlavate
essi parlano	essi parlavano

6 forms

6 forms

The overt agreement properties of English verbs are heavily reduced: regular verbs have in fact only two distinct forms for the present and one form only for the past tense. The verb *be* shows some more overt inflection:

47 I am	I was
you are	you were
he is	he was
we are	we were
you are	you were
they are	they were

3 forms

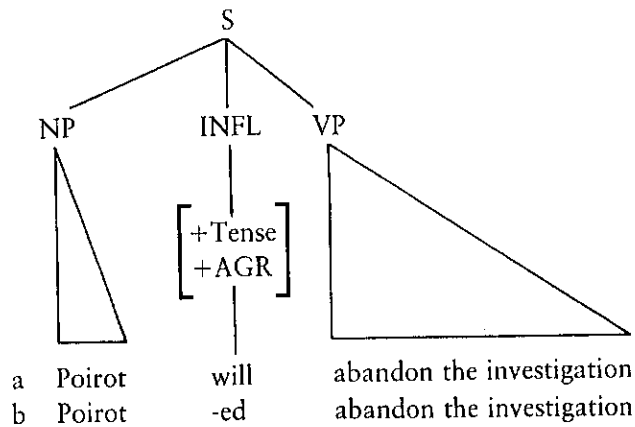
2 forms

Though the overt realization of agreement for person and number is restricted in English, we assume that there is abstract agreement, AGR, which is often not morphologically realized. The difference between English and French or Italian is not taken to be that English lacks AGR, but rather that the abstract AGR has fewer morphological realizations. It is sometimes said that Italian and French AGR are 'stronger' than English AGR. We return to the relevance of the agreement paradigms above for syntactic representations in chapter 8.

We now propose that INFL dominates not only the tense feature of the verb but also its agreement properties, ([AGR] for short).<sup>24</sup>

<sup>24</sup> In recent work (Pollock, 1989) it has been proposed that INFL should be split up into two components, Tense and AGR, which each head one projection. The reader is referred to Pollock's work for discussion. The article should not be tackled until we have studied syntactic movement (chapters 7 and 8).

48



### 3.2.3 INFINITIVAL CLAUSES

In the previous sections we have examined finite or tensed clauses. Let us now turn to infinitival clauses.

Tensed clauses are specified as having an INFL containing the features [+Tense] and [+AGR]. Infinitives typically lack tense marking and agreement. They are [-Tense] and [-AGR]. We can represent the subordinate clause in (49a) by the structure in (49b).<sup>25</sup> We assume that *to* in infinitives corresponds to the verb inflection.

<sup>25</sup> If we analyse the content of INFL in terms of the features [ $\pm$  AGR] and [ $\pm$  Tense] there ought to be four combinations:

[+AGR]  
[+Tense]

[+AGR]  
[-Tense]

[-AGR]  
[+Tense]

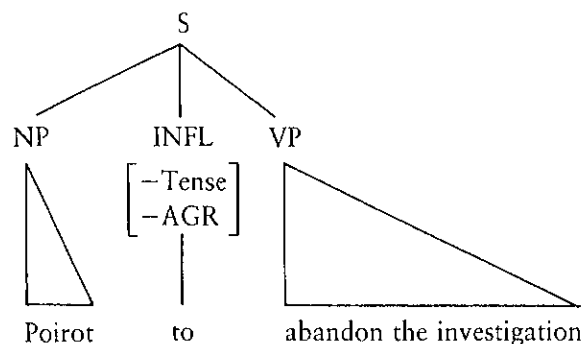
[-AGR]  
[-Tense]

So far, we have illustrated only the combination [+AGR, +Tense] in finite clauses and [-AGR, -Tense] in infinitivals. Raposo (1987) discusses agreeing infinitivals in Portuguese, a case of [+AGR, -Tense]. Stowell (1982) argues that certain infinitives in English are [-AGR, +Tense]. We refer the reader to the literature for discussion.

49a I did not expect [Poirot to abandon the investigation].

50a

49b



### 3.2.4 THE STRUCTURE OF IP

We have based the distinction between finite and infinitival clauses on the content of the node INFL, the features  $[\pm\text{Tense}]$  and  $[\pm\text{AGR}]$ . In other words, the type of clause is determined by the type of INFL. We propose that INFL, a category of the zero level, is the head of S. If we assume that S is headed by INFL it follows that S, like other phrasal categories such as VP, is endocentric: it is a projection of I, IP.

The next question to ask is whether we can fully assimilate IP to the X'-schema in (39) with its three levels of projection. The category INFL dominates material such as verbal inflection, infinitival *to*, aspectual auxiliaries and modals. Tense endings will end up on V; auxiliaries and infinitival *to* are followed by a verb. Since V heads VP, it seems reasonable to argue that I takes a VP as its complement to constitute the I' projection.

In (39) the specifier of the phrase combines with the topmost X' to form X''. In the case of sentences we propose that the subject of the sentence occupies the specifier position, it combines with the I' projection to form I'' or IP. (50a) illustrates this idea by means of a tree diagram representation for the sentences discussed above. (50b) provides a set of phrase structure rules. Again the ordering of the constituents varies cross-linguistically and need not be stated in the PS-rules.<sup>26</sup>

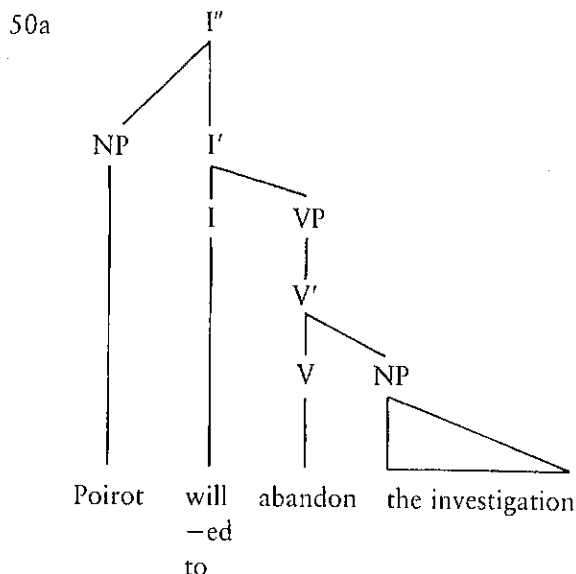
<sup>26</sup> We shall see in chapter 11 that while English has the order SIVO, Dutch and German are assumed to have SOVI.

50b

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<sup>27</sup> Pre  
pre  
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50b I'' → Spec; I'  
I' → I; VP

What is traditionally referred to as the subject of the sentence is the NP immediately dominated by IP, i.e. the NP in the specifier of IP position. This position is often indicated by [Spec, IP] or by [NP, IP]. The reader will observe that the grammatical function 'subject' is not a primitive notion in Government and Binding Theory: it is not a simple or unanalysed concept of the theory. Rather, 'subject' (and 'object' as well) is defined in terms of syntactic configurations; it is a derivative notion based on more elementary concepts in the theory.

Note that there is a distinction to be drawn between phrasal projections of lexical categories and a projection of I, N, V and the other lexical heads we have encountered, belong to what are called open classes. Open classes do not only have a large number of members, but new members may be freely added.<sup>27</sup> Closed classes are groups of a restricted number of elements to which new elements cannot be added.

<sup>27</sup> Prepositions constitute a relatively closed class too, but new prepositions or complex prepositions may be added to the language (cf. *because of*, *in spite of*). We shall continue treating prepositions as part of the lexical categories.

We have proposed that the head of S is INFL. INFL dominates the inflectional morphology of the verb, affixes and infinitival *to*, which are not independent lexical categories or 'words'. The only lexical elements, 'words', that can be dominated by INFL are the aspectual auxiliaries *have* and *be* and the modals. The latter constitute a closed class composed of the following elements: *will*, *can*, *may*, *shall*, *must* and possibly *dare*, *need*, *used* and *ought*. The aspectual and modal auxiliaries in English often correspond to inflectional affixes in other languages. The English perfect is formed with the auxiliary *have*, but Latin uses an inflection (51a). While English uses the modal *shall* or *will* for expressing futurity, Latin again uses a tense ending (51b):

- 51a *English*      *Latin*  
       I have loved    *amavi*  
 51b I shall love    *amabo*

Because INFL does not dominate open class lexical heads, we shall say that it is a non-lexical head.

### 3.3 *S'* as a Projection of C

#### 3.3.1 C AS THE HEAD OF CP

We have now assimilated the structure of S to the X'-schema. In this section we try to extend the format to S'.

Observe that the nature of the unit as a whole, the type of sentence, is determined by the nature of the complementizer:

- 52a I will ask [whether [Poirot will abandon his investigation]].  
 52b I will say [that [Poirot will abandon his investigation]].

The subordinate clause in (52a) is interrogative, that in (52b) is declarative. The difference between the two is signalled by the choice of complementizer introducing the clause, *whether* vs. *that*. In other words, the complementizer determines the type of clause. Because the complementizer is a word, a lexical item, this suggests that we treat the complementizer, represented as C, as the head of S'. Complementizers do not constitute an open class: the four complementizers that introduce subordinate clauses in English are *that*, *if*, *whether*, *for*. Analogously to the discussion of I, we say that the projection of C is a projection of a non-lexical head.

Complementizers such as *whether*, *if*, *that* and *for* introduce a sentence (IP): C takes an IP-complement. The choice of the type of IP is determined by the

choic  
comp  
claus

53a

53b

53c

All tl

54

At th  
[Spec

<sup>28</sup> In  
sul

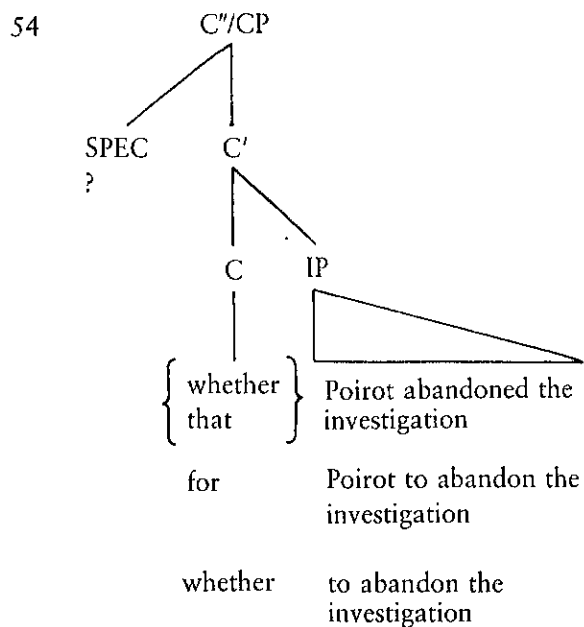
(i)

Of  
19

choice of C. The complementizers *that* and *if* select a finite clause as their complement; *for* selects an infinitival clause and *whether* selects either type of clause:

- 53a I think [that [Poirot abandoned the investigation]].  
\*to abandon
- 53b I expect [for [Poirot to abandon the investigation]].  
\*abandoned
- 53c Jane wonders [whether [Poirot abandoned the investigation]].  
[to abandon the investigation]].

All the bracketed clauses in (53) have the structure in (54):



At this point we have no material to insert in the specifier position of CP, [Spec,CP]. We consider this point in the next section.<sup>28</sup>

<sup>28</sup> In standard English *for* must be absent when the infinitival clause lacks an overt subject NP:

(i) \*It was hard for to abandon the investigation

Other dialects of English, though, allow *for to* sequences to some degree (see Carroll, 1983; Henry, 1989).

## 3.3.2 HEAD-TO-HEAD MOVEMENT

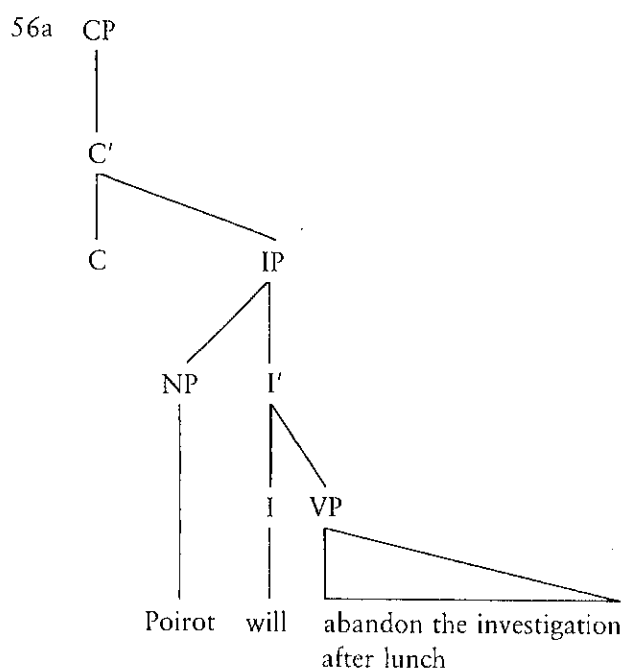
Let us consider the following examples:

55a Poirot will abandon the investigation after lunch.

55b Will Poirot abandon the investigation after lunch?

55c When will Poirot abandon the investigation?

(55a) is a declarative sentence which will be assigned the structure (56a):

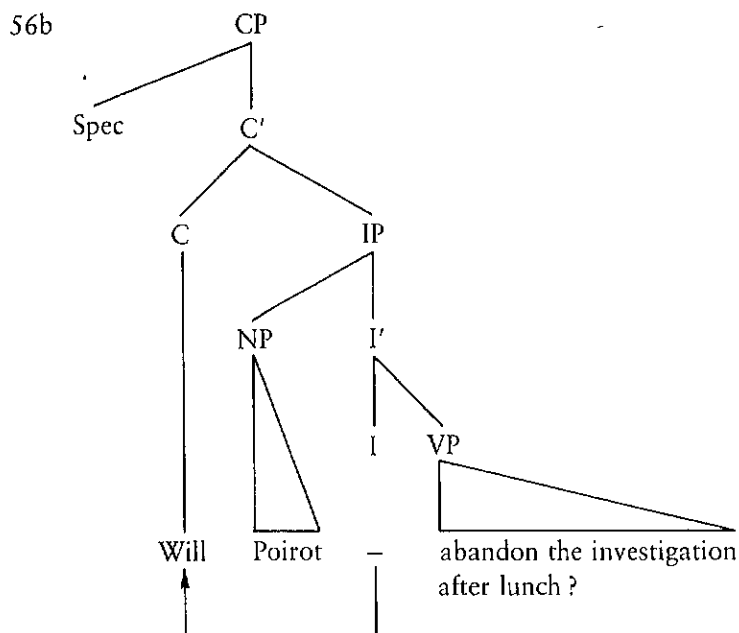


There is no overt complementizer in the sentence and we assume that the head of CP is empty.

(55b) is a direct *yes-no* question characterized by the inversion of subject and auxiliary.<sup>29</sup> How can this order be derived? Various possibilities come to mind. An option that we shall explore here, and that will be elaborated in chapters 7 and 11, is that the auxiliary *will* is moved from its position in I to the position C. In other words, we assume that (55b) has two syntactic

<sup>29</sup> We discuss the different types of questions in chapter 7.

representations. In one, the underlying structure, the modal *will* occupies the position dominated by I, as in (56a). In the second representation, the derived structure, the modal is moved from under I to the position dominated by C. Movement from one head position (in our case I) to another one (C) is called **head-to-head movement** and will be illustrated more extensively in chapters 7 and 11.



(55c) is a constituent-question or *wh*-question. The auxiliary *will* precedes the subject. We assume again that, as was the case in (56b), it has moved under C. In addition, the interrogative constituent *when*, which corresponds to the time adjunct *after lunch* in (55a) and (55b), precedes the auxiliary. We assume that *when* is moved from the sentence-internal position occupied by time adjuncts in (56a) and (56b) to a position preceding C. Without going into the details of the analysis here (see chapter 7), it is clear that the X'-schema as set up offers us a position for *when* to move to: it can be inserted under the specifier-node of CP, [Spec, CP] for short, a position left unoccupied in the earlier examples:



- 58a *Quoi que tu as fait?* (Quebec French)  
 what that you have done (Cf. Koopman, 1983: 389)  
 'What have you done?'  
 58b *Chi che t'è vest?* (Italian Romagnolo dialect; cited in Poggi, 1983)  
 who that you have seen  
 'Whom have you seen?'

In (58a) *quoi* is in [Spec, CP], and *que* is dominated by C. The auxiliary *as* does not invert with the subject. Similarly *chi* in (58b) is in [Spec, CP], and the complementizer *che* appears under C. The auxiliary *è* is again in the IP-internal position. While the overt complementizer may co-occur with the moved *wh*-element in the dialects cited above, it cannot co-occur with an inverted auxiliary. This is predicted if we assume that both complementizer and the inverted auxiliary are dominated by C and if we also assume that a head position is normally occupied by one head only.<sup>30</sup>

Consider also the subordinate clauses in (59):

- 59a *Je me demande [quoi que tu fais].*  
 I wonder what that you do  
 (Quebec French; cited by Koopman, 1983: 389)  
 59b *Men shal knowe [who that I am]* (1485, Caxton R67).  
 (Lightfoot, 1979: 322)  
 59c \**Men shall know who that I am.*

*Quoi* in (59a) precedes *que*, the complementizer. We again assume that *quoi* is in [Spec, CP] and that *que* is dominated by C. The same pattern is found in earlier stages of English as shown in (59b). (59c), the word for word translation of (59b), is ungrammatical in modern English. We return to the syntactic structure of questions in chapter 7.

### 3.3.3 THE STRUCTURE OF CP

We have proposed that the structure of *S'* can be assimilated to the *X'*-format in (39) in the following way:

- 60a  $C' \longrightarrow \text{Spec}; C'$   
 60b  $C' \longrightarrow C; \text{IP}$

<sup>30</sup> In certain languages a V head may incorporate a head N, thus creating a complex lexical unit dominated by V and consisting of V and N. This is apparently not possible in the case of C and V. For a discussion of incorporation the reader is referred to Baker (1988).

C dominates the lexical complementizer or an auxiliary (in sentences with subject-auxiliary inversion). C combines with IP to form C'. C' in turn combines with a specifier to form the maximal projection C'' or CP. The position [Spec, CP] is the position to which interrogative constituents are moved.

### 3.4 Summary: X'-theory and Non-lexical Categories

In section 3 of this chapter we have applied the X'-format, developed in section 2 for phrasal constituents, to the clausal constituents, S (i.e. IP or I'') and S' (CP or C''). The X'-format will allow us to describe the structure of main and dependent clauses and of various types of questions.

We have now reached the important conclusion that all syntactic structure is built on the basis of the X'-format (39). This means that no special phrase structure rule needs to be stated for specific constituents and that when acquiring the language, the child will only need access to (38) to be able to construct both phrasal and clausal constituents.

### 3.5 Small Clauses: a Problem

In chapter 1 we introduced another clause type in addition to tensed clauses and infinitival clauses: small clauses.

61a I consider [Maigret an inspector of great value].

61b Maigret considers [the taxi driver entirely innocent].

61c I consider [your proposal completely out of the question].

The bracketed strings are constituents, as shown in chapter 1. The idea was that in (61a), for instance, *Maigret* is the subject of the predicate *an inspector of great value* exactly like in sentence (62):

62 Maigret is an inspector of great value.

We raised the question as to the category label of these constituents. In the traditional literature they are called verbless clauses; we called them **small clauses**. Let us consider the syntactic representation of the bracketed strings. We choose (61a) but the discussion also applies to the other two examples.



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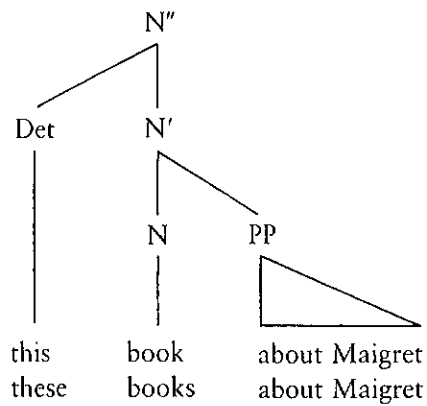
graph TD
    XP --> NP1[NP]
    XP --> N_double_prime[N'']
    NP1 --> Maigret[Maigret]
    N_double_prime --> Det[Det]
    N_double_prime --> N_prime1[N']
    Det --> an[an]
    N_prime1 --> N_prime2[N']
    N_prime1 --> PP[PP]
    N_prime2 --> inspector[inspector]
    PP --> of_value[of great value]
  
```

## 4 Structural Relations

### 4.1 Agreement Patterns

Let us examine some examples of agreement patterns. Consider the NP in (64a):

64a

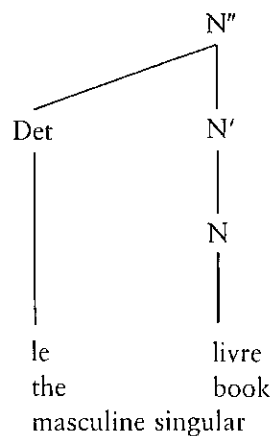


It is well known that demonstrative pronouns in English agree in number with the head of the immediately dominating NP. Agreement is overtly realized: *this* is singular, *these* is plural. Other determiners such as the definite article or possessive pronouns do not exhibit overt morphological agreement:

64b the book/the books  
my book/my books

65

In languages other than English specifier-head agreement between determiners and the head nouns in NPs is more extensively realized morphologically:

65a *French*

les livres  
the books  
masculine plural

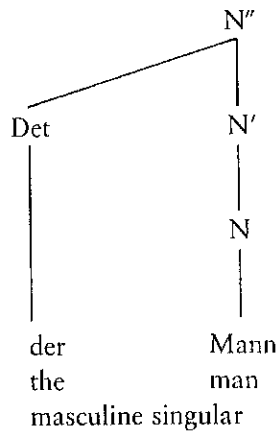
la voiture  
the car  
feminine singular

les voitures  
the cars  
feminine plural

mon livre  
my book

mes livres  
ma voiture  
mes voitures

65b German



die Männer  
the men  
masculine plural

die Frau  
the woman  
feminine singular

die Frauen  
the women  
feminine plural

das Kind  
the child  
neuter singular

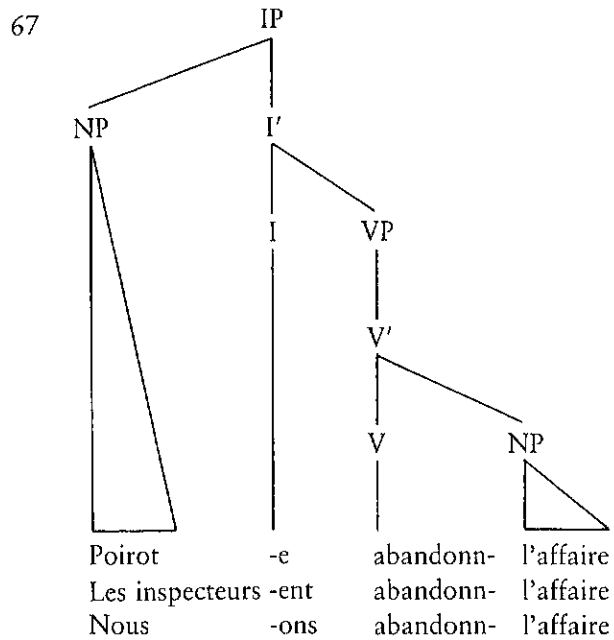
die Kinder  
the children  
neuter plural

The cross-linguistic variation of the overt inflection of NP determiners displayed in (64) and (65) is reminiscent of that discussed with respect to verbal inflection. In French and German NP determiners have rich overt agreement for the nominal features gender and number. The English system is impoverished, though there are traces of overt agreement. We shall assume that even in the absence of overt agreement, English head nouns and their specifiers agree in number and gender. The difference between French and English does not lie in the presence or absence of agreement as such, but rather in the morphological realization of this agreement.

Let us turn to subject-verb agreement. Consider some French examples first:

- 66a Poirot abandonne l'affaire.  
'Poirot abandons the case.'  
66b Les inspecteurs abandonnent l'affaire.  
'The inspectors abandon the case.'  
66c Nous abandonnons l'affaire.  
'We abandon the case.'

In French the verb ending is determined by the person and number of the subject. I and [NP, IP] agree with respect to the relevant nominal features.

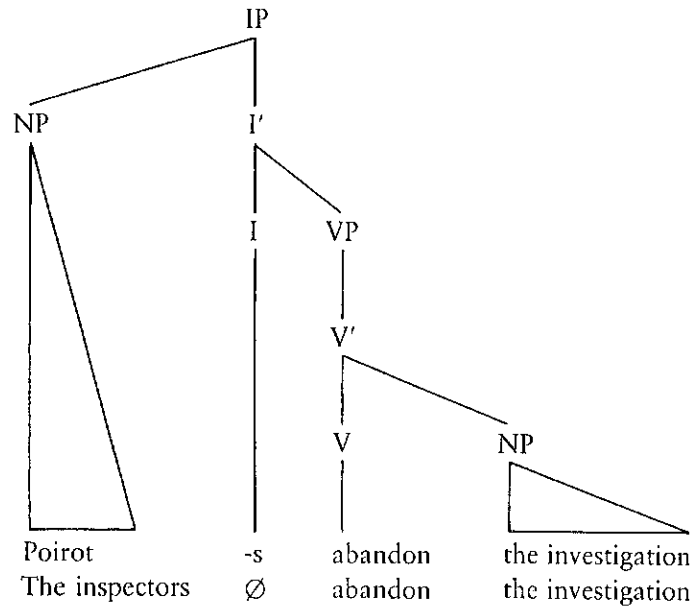


In English there is little overt agreement, but again we have adopted the assumption that INFL is specified for abstract [AGR] in (68):

- 68a Poirot abandons the investigation.
- 68b The inspectors abandon the investigation.
- 68c We abandon the investigation.

Tree diagram (69) is the English analogue of (67):

69



If we compare the tree diagrams (64a), (67) and (69) we find a parallelism in the configurational relations between the agreeing constituents. In all three examples the phrasal head agrees with its specifier. This type of agreement is called **specifier-head agreement**. Head and specifier share features such as number, gender, person. Languages vary with respect to the extent to which agreement between specifier and head in IP and NP are morphologically realized.

In the literature it has been proposed that agreement between specifier and head be represented by means of a subscript<sup>31</sup> on the agreeing elements:

70a these<sub>i</sub> books<sub>i</sub> about Maigret

70b ces<sub>i</sub> livres<sub>i</sub> sur Maigret

The reader might conclude from the discussion above that agreement only affects the pair specifier-head, and also that it must necessarily affect this pair. Both these conclusions would be too rash.

It is not true that agreement only affects the specifier-head relation. Consider the following example from West Flemish, a dialect of Dutch:<sup>32</sup>

<sup>31</sup> Sometimes a superscript is used.

(i) these<sup>i</sup> books<sup>i</sup>

<sup>32</sup> For a discussion of Germanic word-order, see chapter 11.

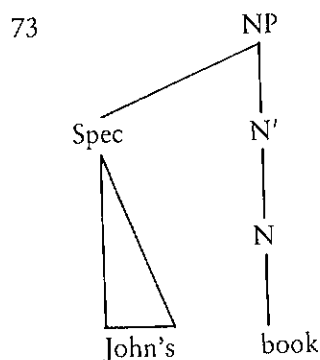
- 71a ... [<sub>C'</sub> [<sub>C</sub> *da* [<sub>I'</sub> *den inspekteur* *da boek gelezen eet*]]].  
           that the inspector that book read has  
 71b ... [<sub>C'</sub> [<sub>C</sub> *dan* [<sub>I'</sub> *d' inspektors* *da boek gelezen een*]]].  
           that the inspectors that book read have

In (71) the perfective auxiliary *eet/leen* agrees in number and person with its subject *den inspekteur/d'inspektors*, illustrating specifier-head agreement. Furthermore, the complementizer *da* agrees in number and person with the subject and with the inflection: *da* is third person singular, *dan* is third person plural. The head of the CP, C, agrees with the head (and the specifier) of its complement IP.

On the other hand, we cannot claim that every element in [Spec, NP] must agree with the head noun:

- 72a the detective's book  
 72b the detectives' book  
 72c the detective's books  
 72d the detectives' books

In (72) the number of the head N *book* is independent of the number of the GENITIVE phrase preceding it. It is normally assumed that in English the GENITIVE phrase occupies [Spec, NP]:



One argument for this assumption is that in English a pre-nominal GENITIVE and a determiner are incompatible, while a pre-nominal determiner and a post-nominal *of*-phrase may co-occur:

- 74a \*this John's book  
       \*a John's book

- 74b a book of John's  
this book of John's

In the case of pre-nominal GENITIVE specifiers the features of the phrase in [Spec, NP] vary independently of those of the head noun.

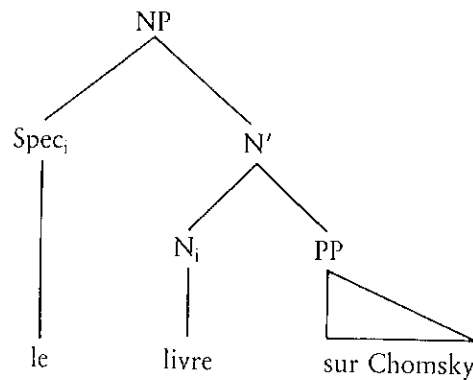
In the next section we shall try to define a unifying relation to characterize the pairs of agreeing constituents discussed.

## 4.2 C-command and Government

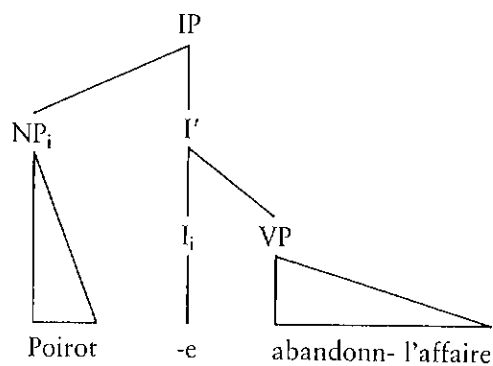
### 4.2.1 C-COMMAND AND THE FIRST BRANCHING NODE

Consider the following representations where co-subscripted nodes indicate agreement:

75a French

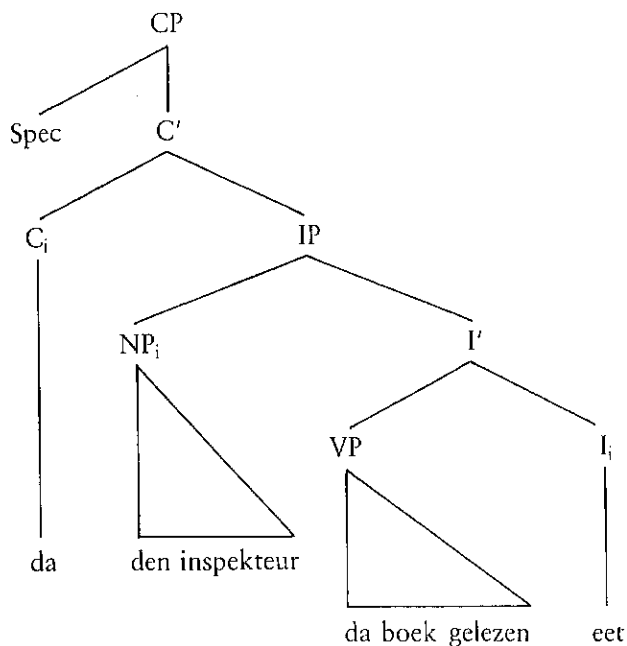


75b

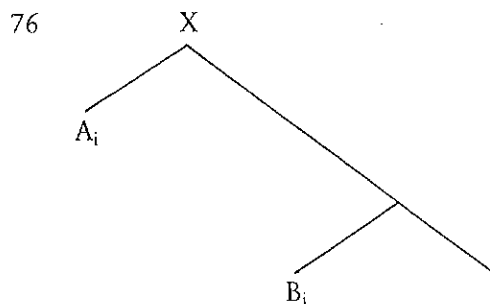




75c West Flemish



In (75a) and (75b) we have specifier-head agreement as discussed above, but the agreement of C and the lower constituents in (75c) cannot be defined in terms of specifier-head agreement. When we consider the geometrical relations between agreeing pairs of element it appears that one agreeing element is always higher in the tree than the element it agrees with.



In all the representations in (75) X, the first branching node dominating A, the highest member of the agreeing pair, also dominates B, the lowest member of the agreeing pair. A itself does not dominate B and B does not dominate A.

In (75a) the first branching node dominating the determiner is NP (N'') and this node also dominates N. Similarly, in (75b) the first branching node dominating the subject NP is IP and IP also dominates I. Finally, in (75c) the first branching node dominating C is C', which also dominates the subject NP and I. The relation which is schematically represented in (76) is one that has been labelled **c-command** (as first discussed and defined by Reinhart, 1981):

#### 77 C-command (1)

Node A c-commands node B iff

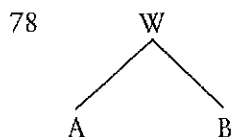
- (a) A does not dominate B and B does not dominate A; and
- (b) the first branching node dominating A also dominates B.

Given a node A it is easy to determine which nodes it c-commands. The procedure is as follows: starting from A we move upward till we reach the first branching node dominating A; then we move downwards following the branches of the tree and every node that we find on our way is c-commanded by A, regardless of whether we move rightward or leftward.

In diagram (75a), for instance, [Spec, NP] c-commands all the nodes dominated by NP. The total of all the nodes c-commanded by an element is the **c-command domain** of that element. In (75a) the NP is the c-command domain of the determiner. In (75b) the subject NP c-commands the entire IP; IP is the c-command domain of the subject. In (75c) C c-commands all the material dominated by C'. C' is the c-command domain of C. The c-command domain of an element is of necessity a constituent, given that it consists of all the material dominated by one node, hence the term c(= constituent)-command. Note in passing that under the definition in (77) a node A always c-commands itself: it will always be possible to start from node A, go up to the first branching node and return then to node A. Nothing in the definition prevents one from returning via the same route.<sup>33</sup>

#### 4.2.2 GOVERNMENT

At this point let us return to our definition of government (7) in terms of sisterhood. Recall that we restrict our attention to government by heads. According to (7) A, a head, governs B in (78).



<sup>33</sup> Chomsky (1986b: n 12) discusses some other ramifications of the definition of c-command. The reader is referred to this work for discussion.

From our discussion of c-command above it follows that A, the governor, c-commands B, the governee; and conversely, B, the governee, c-commands A, the governor. Government could be defined as a relationship of 'mutual c-command'.

79 **Government (2)**

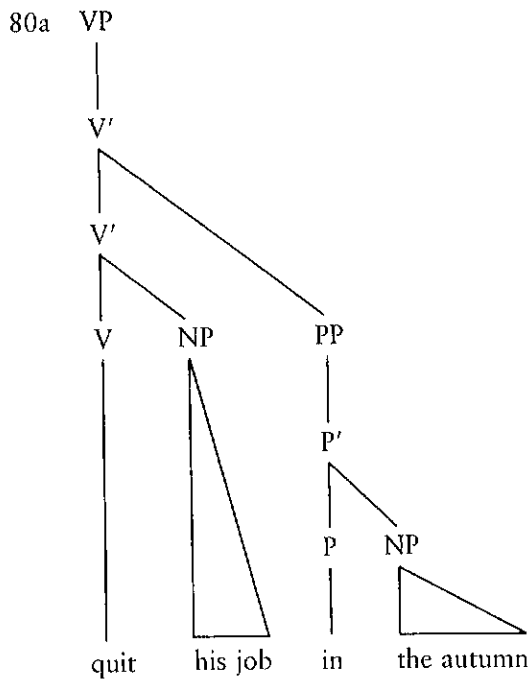
A governs B iff

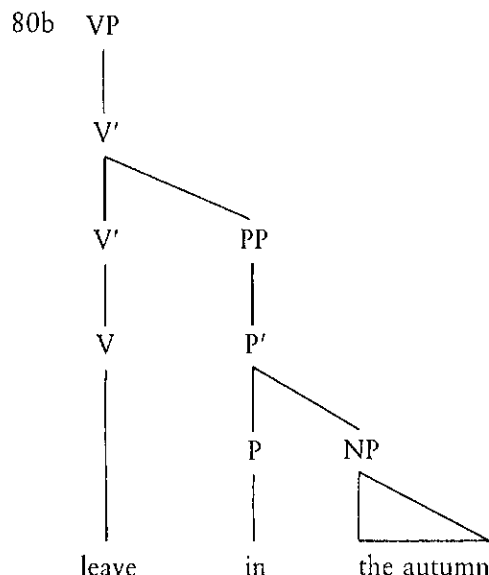
- (i) A is a governor; and
- (ii) A c-commands B and B c-commands A.

We assume that governors are heads. Below and in later chapters we shall refine the notion of government considerably.

4.2.3 M-COMMAND AND GOVERNMENT

Let us consider the following VP structures:





If we adopt our definitions of c-command (77) and government (79) above the relation between V and the PP *in the autumn* in (80a) is quite different from that between V and the PP *in the autumn* in (80b), although in both cases the PP is a time adjunct.

In (80a) the V *quit* c-commands the NP *his job*, which it governs and indeed theta-governs. Following our definitions, the V *quit* does not c-command or govern the time PP *in the autumn*. V does not c-command the PP because the first branching node that dominates it is the lower V', which does not dominate the PP. V does not govern PP because it does not c-command it.

In (80b), the V *leave* c-commands the PP *in the autumn*: the first branching node dominating V is the topmost V', which also dominates the PP. PP also c-commands V since the first branching node dominating PP is the higher V', which also dominates V. We conclude that in (80b) V and the PP *in the autumn* c-command each other. If government is defined in terms of mutual c-command, V will govern the PP. V will not govern P or the NP *the autumn* since there is no mutual c-command relation. V c-commands P and NP; P and NP do not c-command V.

We are thus led to conclude that V governs and c-commands the PP *in the autumn* in (80b) and it fails to do so in (80a). This seems a rather unsatisfactory state of affairs: intuitively one feels that both verbs, *quit* and *leave*, have the same relation to the PP *in the autumn*.

In the literature the definitions of government and c-command have been

discussed extensively.<sup>34</sup> On the basis of various empirical and theoretical considerations which we shall not go into here, it has been proposed that in configurations like those in (80) the V should uniformly govern the PP in both (a) and (b). This will capture our intuition that the relation between V and PP is the same in the VPs in (80a) and (80b). In order to arrive at this conclusion, both the notions of c-command and of government have been reformulated in terms of maximal projections.

In *Barriers*, a work to which we return in chapter 10, Chomsky (1986b: 8) proposes the following definition of c-command:

81 C-command (2)

A c-commands B iff A does not dominate B and every X that dominates A also dominates B.

For the choice of X in (81) two options are considered. When X is equated with the first branching node we obtain the c-command definition given in (77). This structural relation is sometimes referred to as **strict c-command**. Alternatively, X is interpreted as a maximal projection. Under the latter interpretation of (81), A m-commands B.

Let us apply this definition to (80). V c-commands the NP *his job* in (80a) but not the PP *in the autumn*. On the other hand, V m-commands both the NP *his job*, the PP *in the autumn* and also the preposition *in* and the NP *the autumn*. P c-commands the NP *the autumn*, and P also m-commands the NP *the autumn*. However, P does not c-command V: P', the first branching node dominating P, does not dominate V. P does not m-command V either: there is a maximal projection PP which dominates P and does not dominate V.

In (80b) V c-commands PP (unlike in (80a)), and it also m-commands the PP, the head P and the NP inside the PP. The relation between V and P is identical to that in (80a).

Using the notion of m-command Chomsky (1986b: 8) proposes that government be defined as follows:

82 Government (3)

A governs B iff A m-commands B and no barrier intervenes between A and B.

Maximal projections are barriers to government.

Governors are heads.<sup>35</sup>

<sup>34</sup> Aoun and Sportiche (1983) discuss examples like those discussed here.

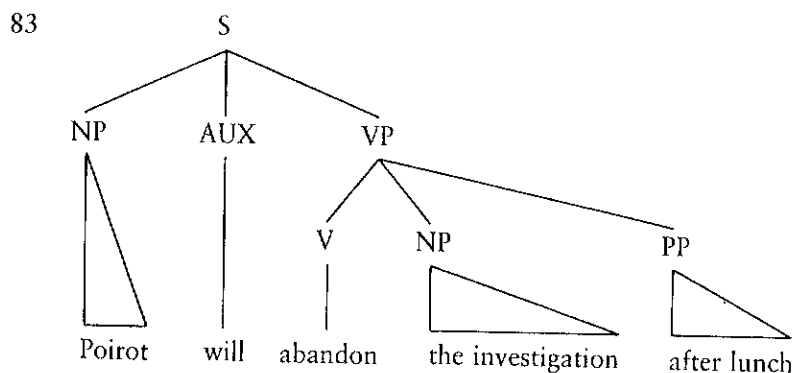
<sup>35</sup> At this point we only look at government by heads. In chapter 8 government by a maximal projection will also be considered.

In both (80a) and (80b) the verbs, *quit* and *leave* respectively, govern the PP *in the autumn*. PP being a maximal projection, the V will not be able to govern into PP. Hence, the verbs in (80a) and in (80b) m-command the NP *the autumn* but they do not govern it.

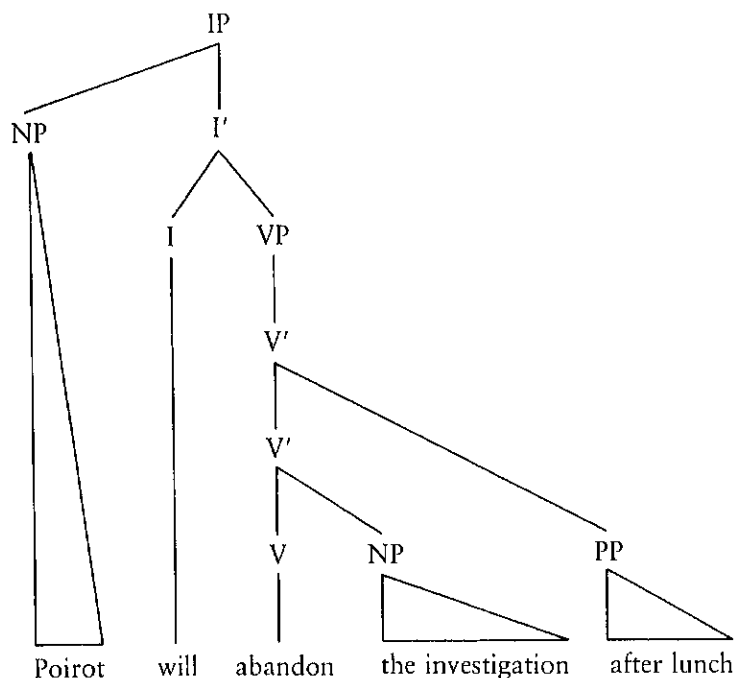
Our new definition of government (82) is intuitively more satisfactory since it allows us to establish the same relation between V and the PP (80a) and (80b). We adopt (82) from now on. The definition will be further modified in chapter 3. We return to the notion barrier in subsequent chapters and especially in chapter 10. As before, when a head governs a constituent and assigns it a thematic role, we say that the head theta-governs the constituent.

## 5 Learnability and Binary Branching: Some Discussion

In this chapter we have looked at the geometry of tree diagrams. We started out from a tree like (83) which we later replaced by (84) for various empirical and theoretical reasons.



84



If we look at the configurational properties of the two trees there is one important contrast to which we have not paid much attention. In (83), with its flat structure, branching nodes are of different types: there are binary branching nodes, such as PP, which dominate two elements, and there are ternary branching nodes, such as VP or S, which dominate three constituents. If we added more constituents to VP we could end up with four-way or five-way branching nodes. In (84) all branching nodes are **binary branching**.

In the course of this chapter the change from the first type of structure to the second was motivated on empirical and theoretical grounds, but there are further advantages to adopting a grammar which allows only the second type.

The reader may point out that such a grammar is more aesthetically satisfying, though aesthetics may be a minor preoccupation for linguists.

A grammar which allows only binary branching nodes is more **constrained** than a grammar which freely allows any type of branching node: in the former type of grammar lots of imaginable representations are ruled out in principle. A more constrained grammar is preferred for reasons of economy and elegance and it will also be preferred if we think of the ultimate goal of linguistic theories in the generative tradition (as discussed in the Introduction).

Remember that linguists wish to account for the fact that children acquire language very fast and at an early age. In order to explain their fast acquisition we posit that children are genetically prepared for the task, that they have an

innate set of principles which enable them to construct the core grammar of their language on the basis of the data they are exposed to.

One component of the child's internalized knowledge of the language, the internal grammar, will concern phrase structure. Theories of phrase structure such as X'-theory attempt to represent the native speaker's internal knowledge of phrase structure.

Let us now compare two theories of phrase structure which differ in one respect. Theory A liberally allows any type of branching (binary, ternary, etc.) Theory B allows only binary branching.

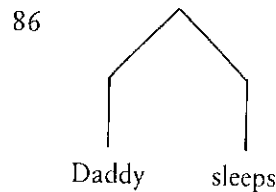
A child faced with linguistic data will have to decide on their phrase structure. Here are a few sentences that a child learning English might hear:

85a Daddy sleeps.

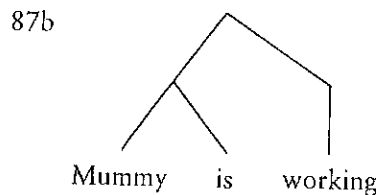
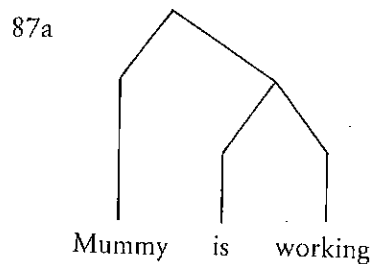
85b Mummy is working.

85c Mummy must leave now.

Theory A and Theory B assign the same structure to (85a):

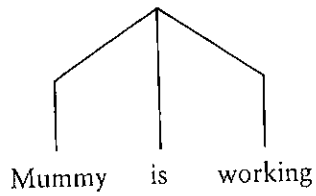


For the structure of (85b) Theory A offers three options:





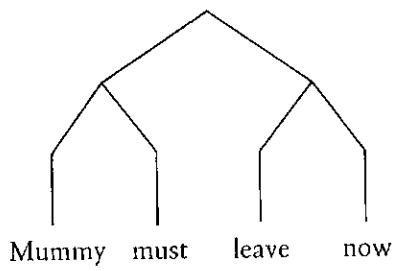
87c



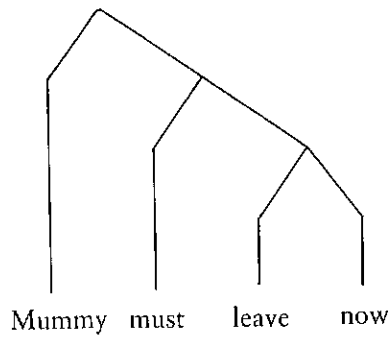
Theory B only allows (87a) and (87b).

For (85c) Theory A offers eight possibilities:

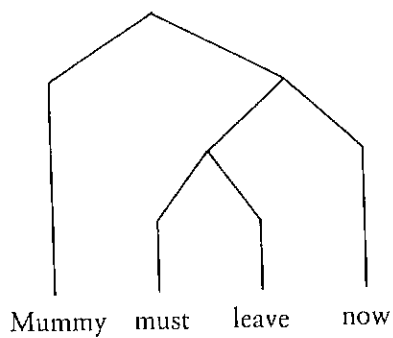
88a



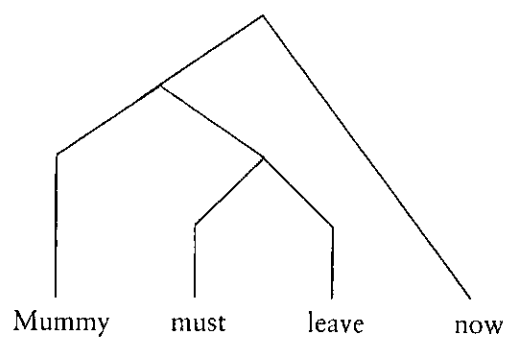
88b



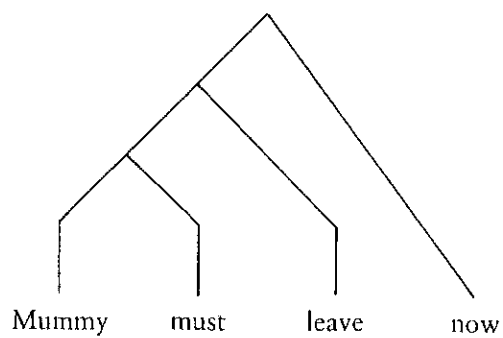
88c



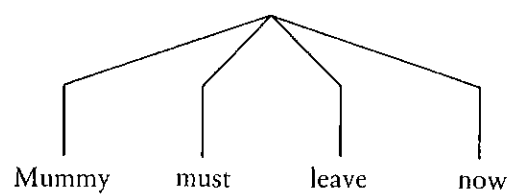
88d



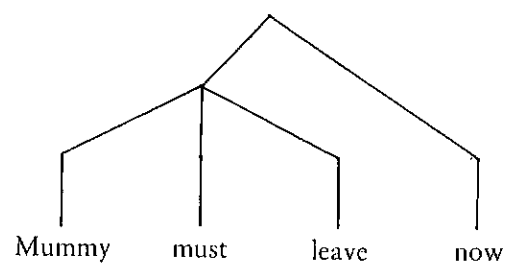
88e



88f



88g



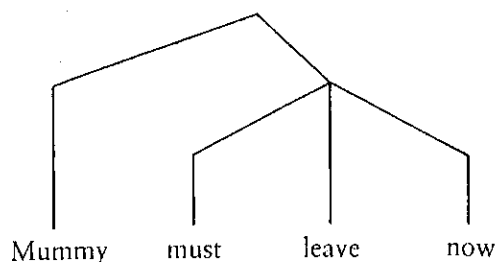
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Theory B, which only allows binary branching, excludes the last three options (88f, g, h).

A child equipped with a UG that implements only binary branching will have fewer decisions to make when assigning syntactic structure to the data he is exposed to than a child equipped with a less constrained UG which allows ternary or four-way branching. It is easy to see that the more elements are involved the more choices are available, and hence that the unconstrained theory will consistently offer more choices than the binary branching theory and hence will make the child's task of deciding on the structure harder. For structuring three elements Theory A offers 50 per cent more possibilities than Theory B (three for A, two for B). For four elements Theory A offers 60 per cent more choices, with eight structures as opposed to five. The more elements there are the larger the discrepancy between the choices offered by Theory A and those by Theory B. You are invited to check for yourself what options would be available in the case of there being five elements.

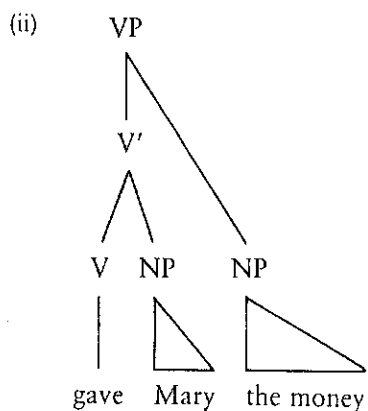
If the ultimate goal of our grammar is to account for language acquisition, then it will be natural to aim for the more restricted type of grammar in which fewer decisions have to be made by the child. Fewer choices will automatically mean more speed in the construction of the core grammar of the language acquired. Nowadays most linguists working in the generative tradition tend to adopt some version of the binary branching framework.<sup>36</sup>

<sup>36</sup> Readers interested in theoretical and empirical implications of the binary branching hypothesis should consult work by Kayne (1984), who is one of the first proponents of the strict binary branching approach in the Government and Binding framework.

The binary branching hypothesis raises some important questions which we shall not go into here. One concerns the structure of double object patterns. Consider (i):

(i) John gave Mary the money.

A representation like (ii) is compatible with the binary branching hypothesis:

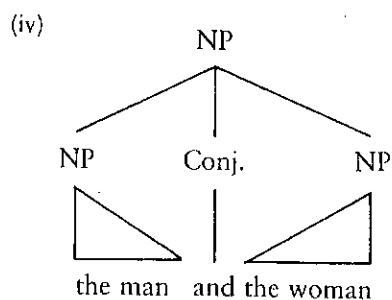


See Kayne (1984) and Larson (1988). Larson (1988) also offers a survey of the recent discussion.

Another issue is the structure of coordinate phrases such as (iii).

(iii) the man and the woman

Often these are assigned a ternary branching structure:



For a discussion of coordinate patterns, see Goodall (1987), who also offers a survey of the literature.

Given the high degree of technicality the books listed above should only be consulted after chapter 8 has been covered.

## 6 Features and Category Labels

So far we have been assuming that the building-blocks of sentences are lexical categories such as N, V, etc. and that these are syntactic **primitives**. Primitives are 'simple', they cannot be further decomposed with respect to their syntactic behaviour.<sup>37</sup> However, not all linguists agree that the simplest syntactic units are words or lexical categories such as N, V, etc.

An analogy with phonology is in order. One might say that phonology is concerned with the study of phonemes, such as /b/ and /d/. Phonologists have proposed, however, that the simplest units, the primitives, at the phonetic/phonological level are not the phonemes. If we restrict our discussion to the level of phonemes we cannot bring out the commonality between the different sounds. For instance, we cannot capture the fact that both /b/ and /d/ are voiced and that both are plosives. It is proposed that the phonemes can be decomposed into smaller component parts, the distinctive **features**. The features bring out the commonality between the sounds and allow us to set up classes of phonemes. For example, the sounds /b/ and /d/ are composed of the following features:<sup>38</sup>

89	/b/	/d/
	[+voice]	[+voice]
	[+plosive]	[+plosive]
	[+bilabial]	[+alveolar]

The features listed in (89) make up a **feature matrix**. The commonality between /b/ and /d/ is brought out by the fact that their feature matrices share the features [+voice] and [+plosive]. Their difference is related to the third feature.

Following the example of phonologists, who consider the distinctive features as the primitives of phonology, syntacticians propose that the lexical categories N, V, etc. are not syntactic primitives but should be seen as complexes of syntactic features. These syntactic features themselves will be the basic building-blocks, the primitives of syntactic structure.

<sup>37</sup> We are not concerned here with the analysis of words into phonemes. Such a decomposition is not syntactically relevant and concerns the phonological component of the grammar. Apart from the identification of verb inflection, we shall not be concerned with the decomposition of words into morphemes either.

<sup>38</sup> For some introductory literature to the notion of features in phonology, see Fromkin and Rodman (1988).

The features that are often taken to constitute the lexical and phrasal categories are  $[\pm\text{noun}]$  ( $[\pm\text{N}]$ ) and  $[\pm\text{verb}]$  ( $[\pm\text{V}]$ ). The lexical categories can be decomposed into their features:

- 90a noun:  $[+\text{N}, -\text{V}]$
- 90b verb:  $[-\text{N}, +\text{V}]$
- 90c adjective:  $[+\text{N}, +\text{V}]$
- 90d preposition:  $[-\text{N}, -\text{V}]$

As in (89), the features in (90) bring out the commonality between the categories which contain the same feature. Anticipating the discussion in chapter 3, it is, for instance, argued that the fact that both verb and preposition may assign case to their complement would be related to their feature  $[-\text{N}]$ . Conversely, the fact that neither N nor A can assign structural case would be due to their shared feature  $[+\text{N}]$ .

There is no clear agreement about the feature composition of C and I at this point. With respect to I we have already mentioned that it contains the features  $[\pm\text{Tense}]$  and  $[\pm\text{AGR}]$ . We shall not go deeper into this issue.<sup>39</sup>

## 7 Summary

In this chapter we have concentrated on syntactic structure. In section 2 we have proposed that a uniform projection schema, the X-bar format, can be developed for all phrasal categories. Phrases are hierarchically structured projections of their heads.

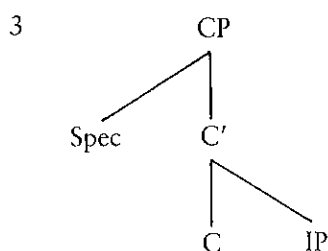
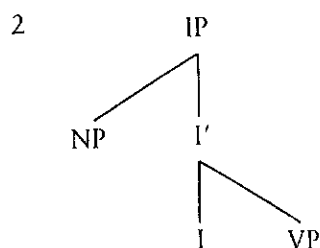
- 1  $\text{XP} \longrightarrow \text{Specifier}; \text{X}'$   
 $\text{X}'^* \longrightarrow \text{X}'; \text{YP}$   
 $\text{X}' \longrightarrow \text{X}; \text{YP}$

The X-bar format allows us to bring out the commonality between the different types of phrases. The traditional phrase structure rules for specific

<sup>39</sup> The reader interested in the theory of features should consult the literature. For the decomposition of the lexical categories, see Chomsky (1970) and Stowell (1981). Muysken (1982) extends the use of features to include the levels of projection  $\text{X}^0, \text{X}'$  and  $\text{X}''$ . Muysken and van Riemsdijk (1986) offer a survey of some of the problems concerning syntactic features. See also Rizzi (1990).

phrases, say VP, are reduced to more elementary notions. The hierarchical organization of the phrase is captured by X'-theory, the relative ordering of constituents will have to be related to some other principle of the grammar.

Section 3 shows that the X-bar schema can be extended to the clausal constituents: S is reinterpreted as a projection of INFL, with the subject NP in the specifier position. S' is reinterpreted as a projection of C.



In section 4 we introduce the structural relations c-command and m-command, and we redefine government in terms of these notions.

#### 4 C-command

A c-commands B iff A does not dominate B and every X that dominates A also dominates B.

When X is equated with the first branching node, A c-commands B. When X is interpreted as a maximal projection, A m-commands B.

#### 5 Government

A governs B iff A m-commands B and no barrier intervenes between A and B.

Maximal projections are barriers to government.

Governors are heads.

We have considered the importance of the binary branching hypothesis especially in the light of language acquisition (section 5) and we have looked at the proposal that syntactic features should replace lexical categories as syntactic primitives (section 6).